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ABSTRACT

To obtain baseline information about the relationship among performances in education programs, certification examinations, and working situations, the 358 cytotechnologists who took the 1965 certification examination in exfoliative cytology were selected for study. Based on questionnaires and other information concerning education and clinical experience, some conclusions were: (1) Almost all of the 306 cytotechnologists for whom information about college science courses was available had credit hours on at least one basic biological science; more than 60 percent took courses in inorganic chemistry, bacteriology, and mathematics; half or fewer had credit in anatomy, physiology, organic chemistry, physics, and other science courses, (2) There was a tendency for those who passed the certification examination to have credit hours in a greater variety of science courses and to receive satisfactory grades in these courses than those who failed the certification examination, (3) There was a direct relationship between evaluations of clinical study and performance in the certification examination, and (4) A higher percentage of failures occurred among cytotechnologists who began their clinical study between 1958 and 1961. (JK)

ED034844

# REPORT

of a

# National Study of Cytotechnologists: Education and Performance Relationships

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# Report of a National Study of Cytotechnologists: Education and Performance Relationships

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# INTRODUCTION

Do current education programs in medical technology adequately prepare students to meet present and future demands in the profession? Do certification procedures adequately test whether or not the medical laboratory personnel will perform well in the laboratory? Questions such as these prompted the National Council on Medical Technology Education in 1964 to obtain baseline information about the relationship among performances in education programs, certification examinations and working situations.

The Council was founded in July 1964 to implement, nationally, the recommendations of the Alabama Project prepared two years earlier. That project made significant contributions to education programs for medical technologists and cytotechnologists in Alabama by developing teaching methods, faculty, and related resource material; by strengthening affiliations between schools of medical technology and Alabama universities; enlarging recruitment efforts for student medical and cytotechnologists; and scheduling program reviews. The success of the Alabama Project encouraged national application of its achievements to the improvement of medical technology education elsewhere.[1]

When the Council first met in 1964, they immediately recognized a need for additional information prior to broad implementation of the Alabama Project recommendations. Consequently, they undertook a program of inquiry designed to elicit general statements of adequacy regarding medical laboratory personnel education and certification programs, and to weight these factors against general statements about job performance of the people who completed this preparation.

The NCMTE program includes three studies. The first, involving medical technologists, was reported in August 1967. The second study pertains to certified laboratory assistants and is scheduled for completion late in 1968. The third study is reported in the following pages which summarize the findings and performance relationships for cytotechnologists.

The 358 cytotechnologists selected for this study constitute the entire group who took the 1965 certification examination in exfoliative cytology given by the Board of Registry of Medical Technologists of the American Society of Clinical Pathologists. Questionnaires completed and returned by the cytotechnologists supplied information about their education and clinical work situations. Additional data concerning their educational preparation and certification records were obtained from the office of the Registry of Medical Technologists (ASCP). Information about the clinical study programs (schools of cytotechnology) was provided by the office of the Board of Schools of Medical Technology (ASCP). Job performance evaluations for the cytotechnologists were submitted by their immediate supervisors at the time the study was conducted. These supervisors also provided information about their own education and experience.

Information from these sources is tabulated and reported in detail in the section of this report entitled "Findings". The methodology employed in obtaining and evaluating data is described in Appendix A. Copies of the questionnaires used appear in Appendices C and D.

The Council staff wish to express their gratitude to Dr. Wellington B. Stewart, Chairman of the Board of Registry of Medical Technologists (ASCP); Dr.Elwood E. Baird, Chairman of the Board of Schools of Medical Technology (ASCP); and their respective office executives, Mrs. Ruth Drummond and Mrs. Anne Brindley, for assistance in obtaining educational background data. In addition, Mr. Robert Sullivan and Miss Marguerite Inglis of the Yalem Scientific Computer Center of St. Louis University, St. Louis, Missouri gave invaluable assistance in computing the findings and statistical detail. Mrs. Arline Howdon, CT(ASCP) and Mrs, Irma Rube, CT(ASCP) gave generously of their time and knowledge by advising in the preparation of questionnaires and interpretation of findings. The cytotechnologists and laboratory supervisors are gratefully acknowledged for diligently completing the lengthy questionnaires, thus making this study possible.

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1/ An account of the Alabama Project and the history of the National Council on Medical Technology Education is presented in Appendix B of this report.

Finally, acknowledgment must be given to four projects which were conducted between 1959 and 1965 because they provide information that gives added meaning to this report. In 1959, the Alabama Project, mentioned earlier, began its program of ascertaining the status of medical and cytotechnology education in that state. Its contributions are summarized in the section entitled "History" (Appendix B).

Two of these projects began in 1961. In September of that year, the Cytology Field Project of the National Committee for Careers in Medical Technology Education was started for the purpose of obtaining information about all phases of education in schools of cytotechnology including recruitment, curricula, teaching aids and the like. The results of site visits to all cytotechnology programs accredited by the Council on Medical Education of the American Medical Association reported by the Field Consultant, Miss Ellen Anderson, MT(ASCP), enhance and, to some extent, are substantiated by the findings reported in these following pages.

The other project in 1961 was a conference entitled "Clinical Cytology and the Pathologist". The conference report contains a systematic and lucid review of the history of organizational activities in the development of clinical cytology, the status of education and certification programs in cytotechnology and cytopathology, and a prediction of future education programs and practice of clinical cytology. This is relevant because the need for implementing some of the recommendations from this conference is supported by findings of the study herein reported. In retrospect, it is possible that the interest stimulated by the Alabama Project, Cytology Field Project and Clinical Cytology conference generated an awareness among those responsible for cytotechnology education which resulted in curricular, accreditation and certification changes evident in these findings.

This increased awareness is evident in the conference held in 1965 entitled "Workshop on Cytology Training for Cytotechnologists and Pathologists". This meeting was held to discuss certain problems pertaining to recruitment and education of cytotechnologists and specialty education for pathologists with the specific request that consideration be given to recommendations for changes in education requirements to be referred to the Board of Schools of Medical Technology (ASCP) and the A.M.A. Council on Medical Education. The report which summarizes workshop discussions, contains consensus regarding the type and amount of pre-clinical study, the length of cytotechnology clinical study, student enrollment, and continuing education needs and programs which are supported by findings of this cytotechnologist study report.

The review of these four projects also reveals the outstanding and continuing support given by the American Cancer Society, Cancer Control Program of the U. S. Public Health Service, American Cytology Society, College of American Pathologists, American Society of Clinical Pathologists, and National Committee for Careers in Medical Technology which has been and must again be acknowledged.

# CONCLUSIONS

## 1. In General

### A. Primary Objectives: Relationship among Certification Examination Performance, Job Performance, and Pre-Clinical and Clinical Study Grades.

This study finds certain relationships among the performance of cytotechnologists in their certification examination, pre-clinical study, clinical study,[1] and their work. This conclusion is based on the following determinations:

> There is a tendency for the cytotechnologists who passed the 1965 certification examination to have a greater variety of science courses in their pre-clinical study than those who failed it.
>
> There is a tendency for the cytotechnologists who passed the 1965 certification examination to receive satisfactory (A,B, and C) grades in college science courses and for those who failed to receive unsatisfactory (D and F) grades, especially in inorganic chemistry, zoology-botany-biology, and mathematics.
>
> Significantly more of those who passed the 1965 certification examination attended clinical study programs accredited by the Council on Medical Education of the American Medical Association than those who failed it.
>
> Significantly more of those who passed the 1965 certification examination were rated "excellent" or "good" by the directors in the clinical study programs than were those who failed it.
>
> There is no statistically significant difference between the job performance ratings given by laboratory supervisors to cytotechnologists who passed the 1965 certification examination and those who failed it.

### B. Related Objectives: Cytotechnology Education in Perspective

This study presents statistically significant evidence supporting the following conclusions:

> Pre-clinical science courses for which grades may be indicators of success or failure in the 1965 certification examination are inorganic chemistry, zoology-botany-biology. and mathematics. The omission of courses in anatomy and bacteriology from pre-clinical study programs may contribute to failure in the certification examination.
>
> Clinical study programs in laboratories accredited as schools of cytotechnology by the A.M.A. Council on Medical Education appear to be more successful in fulfilling the objectives of preparing cytotechnologists to pass the certification examination than are those which are not so recognized.

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[1] "Pre-clinical study" refers to the academic study of physical, biological and medical sciences and elected liberal arts courses in a college or university accredited by an agency recognized for such purposes by the American Council on Education and the National Commission on Accrediting.

"Clinical study" refers to the period of training in cytotechnology in a medical laboratory accredited for such a purpose by the Council on Medical Education of the American Medical Association.

The cytotechnologists' performance in the practical study of cell morphology and cytotscreening is rated higher than in the didactic study of pertinent medical sciences, cytology and cytopreparatory techniques.1/

Women were more successful in passing the 1965 certification examination than men.

The cytotechnologists in this study who began their clinical study between 1958 and 1961 did not perform as well on the 1965 certification examination as did those who began later. Some of the reasons for improved performance in the later period, 1962 through 1964, are surmised to be the following:

1. awareness of the need to develop cytotechnology education programs stimulated by the Alabama Project (1959-1962), Cytology Field Project (1961-1963), and thw workshop entitled "Clinical Cytology and the Pathologist" (1961);
2. implementation of higher standards for basic prerequisites in the accreditation of schools of cytotechnology after 1961;
3. introduction into the 1965 certification examination of some questions pertaining to information not presented in earlier educational programs.

The following findings are important to the perspective of cytotechnology education but are not statistically significant in their distributions:

Cytotechnologists who took more than the minimum requirements of college science courses in pre-clinical study appear to be more adequately prepared for cytotechnology than those who took the minimum or were accepted on the basis of their experience in the specialty.

The clinical programs, reviewed in this study, that appear to be more successful in fulfilling the objectives of preparing cytotechnologists to pass the certification examination are in laboratories having a teaching supervisor with more than five years of experience; staffed by from three through five personnel most of whom are ASCP-certified; accredited capacity, enrollment and graduation of from five through eight students; having a total teaching program comprised of from 840 through 2,080 hours; and having a service workload of from 20,000 through 50,000 cases per year.

The cytotechnologists indicated their satisfaction with cytotechnology education programs by stating that they prepare them adequately to perform the duties assigned to them in their work. It should be noted, however, that the small group adding comments to this inquiry indicated that a weakness in cytotechnology education programs may be insufficient instruction in endocrinology.

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1/ This conclusion is based on the assumption that the first six months of the clinical study program are devoted primarily to the didactic study of pertinent medical sciences, cytology and cytopreparatory techniques and the second six months primarily to the practical application and study of cell morphology and cytoscreening. The cytotechnologists were rated higher in the second six months of clinical study than in the first six months. It should be noted that, in most cases, the ratings for the second six months were given by a different person than those for the first six months. In most cases, the second six months of study was in an institution that is not an accredited school of cytotechnology. See Appendix E for requirements for certification in Exfoliative Cytology.

The content of the 1965 certification examination questions appears to be appropriate for determining the extent to which candidates are prepared to practice cytotechnology because 74% of the items pertain to interpretation of cell morphology and 20% to related basic sciences. The examination may be improved, however, by the addition of questions concerning cytopreparatory and staining techniques.

The majority of cytotechnologists utilized, in their work, instruction in cytopreparatory, staining and microscopic techniques with the exception of cell filtration, staining methods for hormonal and cytogenetic studies, electron and acridine orange fluorescence microscopy.

Instruction in the use of identified quality control measures 1/ appears to be given at an acceptable level to the majority of cytotechnologists with the exception of that involving the separation of staining hypercellular fluids from other specimens.

The cytotechnologists, in their work, seem to use quality control measures at an acceptable level with the exception of the frequency of changing stains and alcohol solutions in staining procedures and the separation of staining hypercellular fluids from other specimens.

The majority of cytotechnologists appear to have sole responsibility for determining normal morphology in their microscopic examinations of specimens because the findings show that two-thirds of them do not have any of their negative slides reviewed by pathologists after they have examined them.

### C. Inconclusive Observations

Lack of information about clinical lecture content precludes conclusive statements regarding the subject matter presented to students in cytotechnology programs.

The extent to which cytotechnologists supervise other technical personnel in the use of quality control measures, and cytopreparatory and staining techniques is not revealed by this study even though they stated that they learned most of these measures and techniques now done by someone else at their place of employment.

## II. Pre-Clinical Program

(Basis for conclusions and tables appear on pages 15-24.)

Information about college science courses taken in pre-clinical study programs was available for 85% (306) of the 358 cytotechnologists selected for this study. In fulfilling the Registry requirements for certification, almost all of the 306 cytotechnologists had credit hours in at least one basic biological science (zoology, botany, biology). More than 60% took courses in inorganic chemistry, bacteriology, and mathematics. Half or fewer of them had credit hours in anatomy, physiology, organic chemistry, physics, quantitative analysis, qualitative analysis, genetics, embryology, histology, and biochemistry (in descending order of frequency).

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1/ The quality control measures are identified in "Findings, E. Characteristics of Cytotechnologists", section on "Working Environment".

There appears to be a tendency for those who passed the 1965 certification examination to have credit hours in a greater variety of science courses and to receive satisfactory (A,B, and C) grades in these courses than those who failed it. This conclusion is based on four findings.

1. Significantly more of those for whom college course information was available passed the 1965 certification examination and more of those for whom it was not available failed it. The latter group is composed of 52 persons who presumably qualified by verification of their experience in cytology because no science course information was available for them.

2. Proportionately more of those who passed the certification examination had more credit hours in science courses than did those who failed. This difference is not statistically significant.

3. Significantly more of those who failed the 1965 certification examination received unsatisfactory (D and F) grades in inorganic chemistry, zoology-botany-biology, and mathematics, particularly those completing one through four credit hours.

4. Significantly more of the cytotechnologists who failed the 1965 certification examination but had satisfactory (A,B, and C) grades did not have any credit hours in anatomy and bacteriology.

Twenty-seven of the cytotechnologists commented about the adequacy of their education program in preparing them for their work. One-third of them stated a need for more science courses such as endocrinology, histology and chemistry, mentioning endocrinology most frequently.

## III. Clinical Program

(Basis for conclusions and tables appear on pages 25-36.)

There is a direct relationship between the result of evaluations of students completing their clinical study in cytotechnology and their subsequent performance in the 1965 certification examination. Despite the subjective nature of the evaluation, significantly more of the cytotechnologists rated "excellent" or "good" in their clinical study passed the 1965 certification examination than those who were rated "fair" or "poor".

The cytotechnologists apparently perform better in practical application than didactic instruction because significantly more of those evaluated on two forms were rated "excellent" during the second half than during the first half of the clinical study period.1/ The effects of cytologic experience during the first 6 months, and of having two evaluations by different pathologists could not be ascertained in this study.

There is a tendency for the cytotechnologists in this study to perform better in the 1965 certification examination if the clinical study programs in schools of cytotechnology include the following:

1. a teaching supervisor with more than five years of experience;
2. from three through five personnel on the staff, most of whom are ASCP-certified;
3. accredited capacity, enrollment and graduation of five through eight students;
4. 840 through 2,080 hours comprising the total program; and
5. a service workload of from 20,000 through 50,000 cases per year.

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1/ The explanation of forms used by clinical program directors is in "Findings:B. Performance in Clinical Study". The terms "didactic" and "practical" are applied to portions of the twelve month clinical program on the assumption that the first six months of clinical study are devoted primarily to the didactic study of pertinent medical sciences, cytology and cytopreparatory techniques and the second six months primarily to the practical application and study of cell morphology and cytoscreening.

Although a small portion (16%) of the 358 cytotechnologists started their clinical study between 1958 and 1961, significantly more of this group failed the 1965 certification examination. Some of the reasons for this failure and subsequent improved performance in the period between 1962 and 1964 are surmised to be the following:

1. 13 of the 19 persons in this fail group were men who failed the examination;
2. realization of the need to develop cytotechnology education programs stimulated by the
    a. Alabama Project (1959-1962) which included a review of schools of cytotechnology and offered assistance in the development of their programs;
    b. Cytology Field Study (1961-1963) which obtained information about all phases of cytotechnology education throughout the country;
    c. workshop, "Clinical Cytology and the Pathologist", (1961) that enabled a discussion of the present and future potential in the education and practice of cytotechnology and cytopathology;
3. implementation of higher standards for basic prerequisites in the accreditation of schools of cytotechnology after 1961;
4. introduction, into the 1965 certification examination, of some questions pertaining to information not presented in earlier educational programs.

Comments about the adequacy of educational programs in preparing cytotechnologists for the duties they perform in their work were made by 27 study participants of whom 21 mentioned deficiencies even though they indicated they felt adequately prepared for their work. Replies from the six persons who said their education programs were inadequate indicated a need for increased emphasis on cytoscreening in the second half of the program and additional instruction in processing and screening non-genital specimens.

Information about the curriculum content of the clinical study program is limited. The annual reports of the schools of cytotechnology only listed the total number of lectures given in the entire program and divided them into didactic and practical segments. The cytotechnologists provided estimated numbers of lectures they received in the general subjects of basic sciences, cytology and cytopreparatory techniques, as well as an approximate number of quizzes and/or examinations during their clinical program. The largest number of lectures were in cytology and the smallest number in basic sciences. The number of cytopreparatory lectures varied more than the others, but more than ten were given in most instances. Quizzes and/or examinations appear to have been given weekly in the programs attended by the cytotechnologists in this study.

The quality control measures and techniques taught in the clinical programs appear to be used in their work by the majority of cytotechnologists, therefore the clinical education program apparently is meeting the needs of the practice of cytotechnology. The major deficiencies are in the use of quality control measures applicable to changing and filtering stains and alcohol solutions used in staining procedures and separating the staining of hypercellular fluids from other specimens.

## IV. Certification Examination

(Basis for conclusions and tables appear on pages 37-39.)

The content of the written and practical sections of the examination apparently is appropriate for fulfilling the objectives of the examination to determine and subsequently certify an individual's readiness to practice cytotechnology effectively. This conclusion is based on the observation that 74% of the questions are related to cell morphology and 20% to pertinent basic sciences. It is noted, however, that the number of questions on techniques is limited and could be augmented to improve the testing in this area.

The difference in the minimum raw scores necessary for passing the two sections of the examination may reduce its effectiveness, therefore it may be advisable to increase the minimum raw score for the written section to the same standard raw score established for the practical section.

## V. Working Environment

(Basis for conclusions and tables appear on pages 40-89.)

The cytotechnologists in this study had been working three years or longer in laboratories throughout the country. Two-thirds of them were situated in hospitals that were larger than the average hospital in the United States. The mean bed capacity of 537 for hospitals in this study is compared with 132 for all non-federal short term general and other special hospitals in the country. The mean bassinet capacity of 51 for the study hospitals is compared with 20 throughout the United States in the above mentioned classifications. Almost all of the remaining one-third of the cytotechnologists worked in independent laboratories.

The types of positions held by the cytotechnologists are almost equally divided between supervisory, non-supervisory and sole cytotechnologist. About one-third of them said they were teaching cytotechnology but most were assisting rather than supervising in educational programs.

Most of the cytotechnologists indicated that their duties were defined by their immediate supervisors and that they felt that they have the responsibility to exercise independent judgment in the performance of their duties.

From half to two-thirds of the cytotechnologists are maintaining good quality control practices by identifying and verifying specimens through use of accession numbers and regular reference to patients' names and case numbers. The quality of staining is controlled at an acceptable level by three-fourths of the cytotechnologists who observe each batch of stained slides for the definition of intra-nuclear structure and intensity of nuclear staining as well as morphological study.

Other quality control measures that are applicable to staining procedures are not used as extensively as is thought advisable. These include the filtering and changing of stains and alcohol solutions used in staining procedures. [1] Precautions to minimize cellular contamination by separately staining hypercellular fluids are not observed, personally, by the majority of cytotechnologists in this study.

The cytotechnologists are involved primarily in microscopic morphology rather than cytopreparation and staining techniques. The latter appear to be the responsibility of other technical assistants.

Participation in some form of continuing education was indicated by three-fourths of the cytotechnologists. The programs attended by the largest number were those presented on a regional basis.

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[1] It should be noted that limitations of the study required literal interpretation of replies and could not account for the size of the workload undertaken by the cytotechnologist participants. It is possible that some or all of them were practicing good quality control in this respect even though their answers did not indicate this. For example, a cytotechnologist working in a laboratory with a workload that justified staining slides twice a week may have changed these solutions each time slides were stained but answered the questions as "twice a week" rather than "each batch of slides" (the advisable frequency).

## VI. Job Performance Rating

(Basis for conclusions and tables appear on pages 90-108.)

The job performance of the cytotechnologists was evaluated by their laboratory supervisors of whom two-thirds were physicians and almost all of the remaining were ASCP-cytotechnologists. The total working experience for two-thirds of the supervisors was more than five years during which three-fourths of them held two or fewer positions prior to their present positions. About three-fourths of them said their current positions were in hospitals and slightly more than half had titles of Laboratory Director. Teaching responsibilities were included in the positions held by 17% of the laboratory supervisors. Three-fourths of them said they had formal education in cytotechnology and cytopathology including 28% who indicated attendance at a school of cytotechnology and 46% in a pathology residency. Participation in continuing education was designated by 87% of the laboratory supervisors of whom most said they attended professional meetings.

The supervisors evaluated the job performance of 158 of the 358 cytotechnologists in 60 items involving skills, dependability, reliability, initiative, and personal relations. Statistical comparison shows no significant difference between the rating for cytotechnologists who passed and those who failed the 1965 certification examination.[1] There is, however, a statistically significant difference in the distribution of ratings for those who passed and failed the certification examination in seven job performance items, of which three are related to technical aspects of their work and four are non-technical in nature but do affect their job performance. Significantly more of the cytotechnologists who passed the examination were rated "excellent" in these seven items than those who failed it. It is of particular interest to note that one of the latter refers to personnel temperament: "Has disposition (temperament) suited to the repetitive, sedentary nature of most of the work in cytotechnology".

A significant portion of the cytotechnologists received ratings in six of the 60 items that varied from the norm for the entire group. Significantly fewer of them were rated "excellent" in five of these items of which one is technically related, one is non-technical in nature, and three pertain to participation in continuing education. The ratings of these three items on continuing education contradict the finding that three-fourths of the cytotechnologists indicated their participation in such programs. Significantly fewer of the cytotechnologists were rated "excellent" in one item which is technically related.

The subjectiveness inherent in the supervisors' evaluation should not be totally disregarded. Unfortunately, the scope of this report does not permit measurement of the extent to which these findings reflect more critical value judgments by the supervisors toward technical aspects of the laboratory work than those toward non-technical aspects.

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[1] Of the 158 cytotechnologists rated for job performance, 141 passed and 17 failed the 1965 certification examination.

# RECOMMENDATIONS

The following recommendations are based on the information obtained and conclusions derived during this study.

It is recommended that

1. the Board of Schools of Medical Technology (ASCP) and the A.M.A. Council on Medical Education consider the following in the next revision of Essentials for Schools of Cytotechnology:
   a. a minimum staff of three persons, most of whom are ASCP-certified cytotechnologists;
   b. a minimum capacity of five students; and
   c. increasing the number of credit hours in biological and medical science courses required for admission to the schools of cytotechnology.

2. the Board of Registry of Medical Technologists (ASCP)
   a. revise the requirements for certification in exfoliative cytology to
      1) provide that attendance at a school of cytotechnology accredited by the Council on Medical Education of the A.M.A. is mandatory for candidates for this examination; and
      2) delete the prerequisite of substitution of experience obtained prior to 1960 for attendance at an accredited school of cytotechnology;
   b. revise the examination for certification in exfoliative cytology to include additional testing in cytopreparation and staining procedures.

3. clinical programs in cytotechnology education be strengthened through additional instruction in quality control measures pertaining to staining procedures.

4. cytotechnology education programs, either pre-clinical or clinical, be strengthened by increasing emphasis on endocrinology.

5. further studies be undertaken to determine
   a. the content of curricula and course work (lectures) in schools of cytotechnology;
   b. the utilization of quality control measures in cytotechnology, the extent to which cytotechnologists are prepared to exercise judgment, and the contribution of both to the performance of laboratory work in this specialty;
   c. the extent to which cytotechnologists supervise other personnel in the laboratory involved in cytopreparatory and staining procedures;
   d. the frequency with which laboratory directors confer with cytotechnologists regarding results of cytoscreening and cytodiagnostic interpretation;
   e. the degree of latitude employed by laboratory supervisors in judging cytotechnologists' performance relating to both technical and non-technical aspects of this laboratory work and if cytotechnologists generally perform or fail to perform within the expectations and demands of their supervisors.

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# A. PERFORMANCE IN PRE-CLINICAL STUDY

Information about college science courses taken by 85% (306) of the cytotechnologists was available in the office of the Registry of Medical Technologists (ASCP). Almost all (97%) of these cytotechnologists had credit hours in zoology, botany and/or biology. Eighty percent of them took inorganic chemistry. Bacteriology and mathematics courses were taken by 61% of this group. Half or fewer of them had credit hours in anatomy, physiology, organic chemistry, physics, quantitative analysis, qualitative analysis, genetics, embryology, histology, and biochemistry. (Table 1)

Evaluation of pre-clinical study performance of these cytotechnologists is based on the credit hours and grades they received in the above mentioned physical, biological and medical science courses taken in college prior to entering clinical study programs. Grades of A,B, and C were grouped arbitrarily as "satisfactory" performance and those of D and F as "unsatisfactory" for purposes of this study. This evaluation was made on 37% (133) of the cytotechnologists for whom college transcripts of credit hours were available.1/ Eighty-seven percent of the 133 cytotechnologists passed the 1965 certification examination and 13% failed it.

Analysis of these data for 133 cytotechnologists shows that significantly more of those who failed the 1965 certification examination received unsatisfactory grades in inorganic chemistry, zoology-botany-biology, and mathematics, particularly those completing one through four credit hours. (Table 2) Significantly more of the cytotechnologists who failed the certification examination but had satisfactory grades did not have any credit hours in bacteriology and anatomy courses. (Table 3) Significantly more 2/ of the cytotechnologists who were also M.T.(ASCP) had satisfactory grades in organic chemistry and more of those who were not so certified had unsatisfactory grades in that course. (Table 4)

Only credit hours (no grades) were available for 48% (173) of the cytotechnologists on special Registry forms.1/ Eighty-nine percent of the 173 cytotechnologists passed the 1965 certification examination and 11% failed it. In comparing the number of persons who passed with those who failed the examination, there is no statistically significant difference in the various courses they took.3/ Proportionately, however, more of those who passed had more credit hours in the science courses than did those who failed. (Table 5) The comparison of cytotechnologists with and without M.T.(ASCP) certification shows that a larger percent of those who are M.T.(ASCP)C.T. have taken the listed science courses with the major exception of mathematics. It is possible, though, that the credit hours taken in mathematics were omitted from the Registry forms because this course was only recently a requirement for M.T.(ASCP) certification.4/ (Table 6)

Information about college courses was not available for 15% (52) of the cytotechnologists. Most (45) of them received their training in cytotechnology prior to 1960. Verification of their experience under the direction of recognized physicians in cytology qualified them for taking the certification examination.

Of the 306 cytotechnologists for whom college course information was available, 88% passed the 1965 certification examination and 12% failed. Of the remaining group (52) for whom no information was filed, 71% passed and 29% failed. This difference is statistically significant in that more of those for whom credit hours data were available passed the examination and more of those for whom they were not available failed it. 5/

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1/ The procedure for entering these and related data is described in the Appendix.

2/ This distribution is significant at 0.10 probability level but not at 0.05 probability level. The probability level for outstanding findings chosen for this report is 0.05.

3/ $X^2 = 1.61$; df = 13, $X^2 = 22.36$

4/ The Registry form contains a list of only the science courses included in the requirements for certification. Mathematics was not listed prior to 1962 on the medical technologist forms, unless it was added incidently in the compliation of credit hours.

5/ $X^2 = 10.61$; df = 2, $X^2 = 5.99$.

## TABLE 1

## COLLEGE SCIENCE COURSES TAKEN BY 306 CYTOTECHNOLOGISTS

| College Science Courses | Percent of 306 Cytotechnologists[a] taking courses | | | Percent of 133 Cytotechnologists[a] taking courses and with A,B,C and D,F grades | | | | | | Percent of 173 Cytotechnologists[a] taking courses | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Total | Pass Exam[b] | Fail Exam[b] | Total | Pass Exam[b] | Fail Exam[b] | A,B,C grades | D,F grades | A,B,C & D,F grades | Total | Pass Exam[b] | Fail Exam[b] |
| | %[c] | %[c] | %[c] | %[c] | %[c] | %[c] | %[d] | %[d] | % | % | % | % |
| Chemistry: | | | | | | | | | | | | |
| Inorganic Chemistry | 80 | 71 | 9 | 81 | 69 | 12 | 71 | 30 | 20 | 79 | 73 | 6 |
| Organic Chemistry | 35 | 32 | 3 | 37 | 32 | 5 | 29 | 17 | 10 | 33 | 32 | 1 |
| Quantitative Analysis | 29 | 27 | 2 | 29 | 28 | X[e] | 26 | 11 | 8 | 29 | 27 | 2 |
| Qualitative Analysis | 28 | 24 | 4 | 25 | 19 | 6 | 21 | 5 | X[e] | 30 | 28 | 2 |
| Biochemistry | 10 | 10 | X[e] | 14 | 13 | X[e] | 12 | 2 | X[e] | 8 | 8 | X[e] |
| Biological & Medical Sciences: | | | | | | | | | | | | |
| Zoology-Botany-Biology | 97 | 86 | 11 | 95 | 84 | 11 | 92 | 20 | 17 | 99 | 88 | 11 |
| Bacteriology | 61 | 55 | 6 | 61 | 56 | 5 | 57 | 10 | 6 | 61 | 54 | 7 |
| Physiology | 46 | 42 | 5 | 47 | 42 | 5 | 42 | 5 | 0 | 46 | 41 | 5 |
| Anatomy | 50 | 46 | 4 | 45 | 41 | 4 | 42 | 5 | 2 | 54 | 50 | 5 |
| Histology | 24 | 22 | 2 | 23 | 22 | X[e] | 22 | 2 | X[e] | 25 | 23 | 2 |
| Genetics | 26 | 23 | 3 | 29 | 26 | 3 | 25 | 6 | 2 | 24 | 22 | 2 |
| Embryology | 2[illegible] | 22 | 3 | 20 | 19 | 1 | 17 | 4 | X[e] | 29 | 26 | 3 |
| Mathematics | 61 | 55 | 6 | 70 | 59 | 11 | 62 | 25 | 17 | 53 | 51 | 2 |
| Physics | 34 | 30 | 4 | 38 | 32 | 6 | 33 | 14 | 9 | 31 | 29 | 2 |

a. Information about college science courses was not available in the Registry of Medical Technologists (ASCP) office for 52 of the 358 cytotechnologists. The figures in this table applicable to the 306 cytotechnologists combine those for 133 for whom actual college transcripts of credit hours and grades were filed, and 173 whose college transcript credit hours (no grades) were available from a permanent record form filed in the Registry office. The figures applicable only to 133 and 173 cytotechnologists, respectively, are given under the appropriate headings in this table. For example: Of the 306 cytotechnologists, 80% took inorganic chemistry including 71% who passed and 9% who failed the 1965 certification examination. Of the 133 cytotechnologists, 81% took inorganic chemistry including 69% who passed and 12% who failed the 1965 certification examination; and also including 71% who received A,B,C grades, 30% who received D,F grades, and 20% who received both A,B,C and D,F grades in this course. Of the 173 cytotechnologists, 79% took inorganic chemistry including 73% who passed and 6% who failed the 1965 certification examination.

## Footnotes for Table 1
(continued)

b. This refers to the examination given annually by the Board of Registry of Medical Technologists (ASCP) for certification of cytotechnologists.

c. The figures from which the percents were calculated for Total, Passed Exam, and Failed Exam for 306 and 133 cytotechnologists, respectively, are adjusted to exclude the duplication of individuals who received both A,B,C and D,F grades when they repeated courses (see footnote d).

d. The figures used for calculating the percents for A,B,C and D,F grades include all of the 133 cytotechnologists receiving these grades. Some of these cytotechnologists who received D,F grades repeated the particular course and received A,B,C grades. The group doing this is represented in the "ABC & DF Grades" column. The percents in this column represent the adjustment necessary to account for duplication of individuals in the two previous columns to derive the actual number of people taking the particular courses. (Total, Pass Exam, Fail Exam columns)

e. X = Less than 1%.

## TABLE 2

## CREDIT HOURS AND GRADES
From
COLLEGE TRANSCRIPTS SHOWING SCIENCE COURSES
Taken By
133 CYTOTECHNOLOGISTS[a]

| College Science Courses | Percent of 133 Cytotechnologists with A, B, C Grades[b] | | | Percent of 133 Cytotechnologists with D, F Grades[b] | | |
|---|---|---|---|---|---|---|
| | Took Course | Credit Hours | | Took Course | Credit Hours | |
| | | 1 thru 4 | 5 or more | | 1 thru 4 | 5 or more |
| | % | % | % | % | % | % |
| Chemistry: | | | | | | |
| Inorganic Chemistry | 71 | 20 | 52 | 30 | 18[d] | 12 |
| Organic Chemistry | 29 | 11 | 18 | 17 | 8 | 10 |
| Quantitative Analysis | 26 | 20 | 7 | 11 | 9 | 2 |
| Qualitative Analysis | 22 | 17 | 5 | 5 | 2 | 2 |
| Biochemistry | 12 | 11 | 2 | 2 | 2 | X[c] |
| Biological & Medical Sciences: | | | | | | |
| Zoology-Botany-Biology | 92 | 11 | 82 | 20 | 13[d] | 7 |
| Bacteriology | 57 | 38 | 19 | 10 | 8 | 2 |
| Physiology | 42 | 36 | 6 | 5 | 5 | X[c] |
| Anatomy | 41 | 22 | 20 | 5 | 4 | 2 |
| Histology | 22 | 19 | 3 | 2 | 2 | 0 |
| Genetics | 24 | 23 | X[c] | 7 | 7 | 0 |
| Embryology | 17 | 15 | 2 | 4 | 4 | 0 |
| Mathematics | 62 | 23 | 38 | 25 | 16[d] | 9 |
| Physics | 32 | 14 | 19 | 14 | 8 | 6 |

a. Actual college transcripts of credit hours and grades were available in the office of the Registry of Medical Technologists (ASCP) for 133 of the 358 people who took the 1965 certification examination for cytotechnologists.

b. The data involving the cytotechnologists' grades in college science courses were assigned to two groups to indicate satisfactory (A, B, and C) and unsatisfactory (D and F) performance. The percents represent the portion of 133 cytotechnologists who received A, B, and C grades and the portion of the same group (133 cytotechnologists) who received D and F grades in the science courses listed. The ABC group includes cytotechnologists who repeated courses because of previous failing grades.

c. X = Less than 1%.

d. Calculation of chi square test for distribution shows that these figures are statistically significant because the frequency of replies exceeds the 0.05 probability level. The Kolmogorov-Smirnov formula was used.
Inorganic Chemistry: $X^2 = 11.99$; df = 2, $X^2 = 5.99$
Zoology-Botany-Biology: $X^2 = 25.04$; df = 2, $X^2 = 5.99$
Mathematics: $X^2 = 6.28$; df = 2, $X^2 = 5.99$

## TABLE 3

### CREDIT HOURS AND GRADES
### From
### COLLEGE TRANSCRIPTS SHOWING SCIENCE COURSES
### Taken By
### 133 CYTOTECHNOLOGISTS[a]
### According To
### 1965 CERTIFICATION EXAMINATION[b] PERFORMANCE

| College Science Courses | Percent of 133 Cytotechnologists With A, B, & C Grades[c] & Credit Hours | | | | | | Percent of 133 Cytotechnologists With D & F Grades[c] & Credit Hours | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | | 1 thru 4 | | 5 or more | | 0 | | 1 thru 4 | | 5 or more | |
| | Pass | Fail | Pass | Fail | Pass | Fail | Pass | Fail | Pass | Fail | Pass | Fail |
| | $\%^c$ | $\%^c$ | $\%^c$ | $\%^c$ | $\%^c$ | $\%^c$ | $\%^c$ | $\%^c$ | $\%^c$ | $\%^c$ | $\%^c$ | $\%^c$ |
| Chemistry: | | | | | | | | | | | | |
| Inorganic Chemistry.................. | 29 | 29 | 18 | 29 | 53 | 41 | 73 | 47 | 17 | 24 | 9 | 29 |
| Organic Chemistry.................... | 71 | 71 | 12 | 6 | 17 | 24 | 82 | 88 | 9 | 0 | 9 | 12 |
| Quantitative Analysis................ | 71 | 94 | 22 | 6 | 8 | 0 | 92 | 71 | 6 | 29 | 2 | 0 |
| Qualitative Analysis ................ | 80 | 65 | 16 | 29 | 4 | 6 | 97 | 88 | 2 | 6 | 2 | 6 |
| Biochemistry ........................ | 87 | 94 | 11 | 6 | 2 | 0 | 97 | 100 | 2 | 0 | $X^d$ | 0 |
| Biological & Medical Sciences: | | | | | | | | | | | | |
| Zoology-Botany-Biology .............. | 6 | 18 | 10 | 12 | 84 | 71 | 84 | 59 | 12 | 18 | 4 | 24 |
| Bacteriology ........................ | 38 | 76[e] | 42 | 12 | 20 | 12 | 91 | 88 | 7 | 12 | 3 | 0 |
| Physiology .......................... | 56 | 71 | 38 | 24 | 6 | 6 | 96 | 88 | 3 | 12 | $X^d$ | 0 |
| Anatomy.............................. | 54 | 88[e] | 23 | 12 | 22 | 0 | 97 | 82 | 2 | 18 | 2 | 0 |
| Histology............................ | 76 | 94 | 21 | 6 | 3 | 0 | 98 | 100 | 2 | 0 | 0 | 0 |
| Genetics ............................ | 76 | 76 | 23 | 24 | $X^d$ | 0 | 93 | 94 | 7 | 6 | 0 | 0 |
| Embryology .......................... | 81 | 94 | 16 | 6 | 3 | 0 | 97 | 94 | 3 | 6 | 0 | 0 |
| Mathematics.............................. | 40 | 29 | 24 | 18 | 36 | 53 | 75 | 76 | 16 | 12 | 9 | 12 |
| Physics.................................. | 69 | 59 | 14 | 12 | 17 | 29 | 85 | 94 | 9 | 6 | 7 | 0 |

## Footnotes for Table 3

a. Actual college transcripts of credit hours and grades were available in the office of the Registry of Medical Technologists (ASCP) for 133 of the 358 people who took the 1965 certification examination for cytotechnologists.

b. This refers to the examination given annually by the Board of Registry of Medical Technologists (ASCP) for certification of cytotechnologists.

c. The data involving the cytotechnologists' grades in college science courses were assigned to two groups to indicate satisfactory (A, B, and C) and unsatisfactory (D and F) performance. The percents represent the portion of 116 and 17 cytotechnologists who passed and failed (respectively) the 1965 certification examination and received A, B, C grades and D, F grades in the science courses listed.

d. X = Less than 1%.

e. Calculation of chi square test for distribution shows that these figures are statistically significant because the frequency of replies exceeds the 0.05 probability level. The Kolmogorov-Smirnov formula was used.
Anatomy: $X^2 = 6.83$; df = 2, $X^2 = 5.99$
Bacteriology: $X^2 = 8.81$; df = 2, $X^2 = 5.99$

## TABLE 4

## GRADES FROM COLLEGE TRANSCRIPTS FOR SCIENCE COURSES
Taken By
133 CYTOTECHNOLOGISTS[a]
According to
TYPE OF CERTIFICATION[b]

| College Science Courses | Percent of 133[c] Cytotechnologists with grades[d] of | | Percent of 100 CT(ASCP) with grades[d] of | | Percent of 30 MT(ASCP)CT with grades[d] of | |
|---|---|---|---|---|---|---|
| | ABC | DF | ABC | DF | ABC | DF |
| | % | % | % | % | % | % |
| Chemistry: | | | | | | |
| Inorganic Chemistry ................ | 71 | 30 | 62 | 33 | 97 | 20 |
| Organic Chemistry .................. | 29 | 17 | 20 | 19[e] | 63[e] | 13 |
| Quantitative Analysis .............. | 26 | 11 | 14 | 10 | 70 | 13 |
| Qualitative Analysis................ | 22 | 5 | 17 | 6 | 40 | 0 |
| Biochemistry........................ | 12 | 2 | 8 | 2 | 27 | 3 |
| Biological & Medical Sciences: | | | | | | |
| Zoology-Botany-Biology.............. | 92 | 20 | 92 | 25 | 93 | 3 |
| Bacteriology........................ | 57 | 10 | 51 | 9 | 80 | 13 |
| Physiology.......................... | 42 | 5 | 37 | 7 | 60 | 0 |
| Anatomy ............................ | 41 | 5 | 40 | 6 | 50 | 3 |
| Histology .......................... | 22 | 2 | 18 | 1 | 37 | 3 |
| Genetics............................ | 24 | 7 | 25 | 8 | 23 | 3 |
| Embryology.......................... | 17 | 4 | 17 | 4 | 20 | 3 |
| Mathematics ........................ | 62 | 25 | 58 | 27 | 70 | 10 |
| Physics ............................ | 32 | 14 | 27 | 12 | 50 | 20 |

a. Actual college transcripts of credit hours and grades were available in the office of the Registry of Medical Technologists (ASCP) for 133 of the 358 people who took the 1965 certification examination for cytotechnologists.

b. The Board of Registry of Medical Technologists (ASCP) gives examinations for certification of medical technologists (M.T.(ASCP)). Individuals so certified may also qualify for and take the examination for cytotechnologists. There were 52 M.T.(ASCP) who took the 1965 cytotechnologists' certification examination of whom 30 had transcripts of credit hours and grades in their files in the Registry office. Certification in both areas is designated as "M.T.(ASCP)C.T.".

c. Three of the 133 people were certified as H.T.(ASCP)C.T. They took the following courses and had the indicated grades:

| | | |
|---|---|---|
| Inorganic Chemistry | 2 in ABC group | 1 in DF group |
| Zoology-Botany-Biology | 3 in ABC group | 0 in DF group |
| Physiology | 1 in ABC group | 0 in DF group |
| Bacteriology | 1 in ABC group | 0 in DF group |
| Mathematics | 3 in ABC group | 1 in DF group |
| Physics | 1 in ABC group | 1 in DF group |

d. The data involving the cytotechnologists' grades in college science courses were assigned to two groups to indicate satisfactory (A, B, and C) and unsatisfactory (D and F) performance. The percents represent the portions of the respective groups of cytotechnologists (133; 100; 30) who received A, B, and C grades and D and F grades in the science courses listed. The ABC groups may include cytotechnologists who repeated courses because of previous failing grades.

## Footnotes for Table 4
(continued)

e. Calculation of chi square test for distribution shows that these figures are statistically significant because the frequency of replies exceeds the 0.10 probability level. It is noted that the probability level for outstanding findings chosen for this report is 0.05. The Kolmogorov-Smirnov formula was used.
Organic Chemistry: $X^2 = 5.68$; $df = 2$, $X^2 = 4.61$ (0.10 probability level)

## TABLE 5

### CREDIT HOURS FROM REGISTRY FORM[a] FOR COLLEGE SCIENCE COURSES
Taken By
173 CYTOTECHNOLOGISTS
According To
1965 CERTIFICATION EXAMINATION[b] PERFORMANCE

| College Science Courses | Percent of 173 Cytotechnologists with credit hours of | | Percent of 154 Passing[b] cytotechnologists with credit hours of | | Percent of 19 Failing[b] cytotechnologists with credit hours of | |
|---|---|---|---|---|---|---|
| | 1 thru 4 | 5 or more | 1 thru 4 | 5 or more | 1 thru 4 | 5 or more |
| | % | % | % | % | % | % |
| Chemistry: | | | | | | |
| Inorganic Chemistry........... | 12 | 67 | 12 | 70 | 16 | 42 |
| Organic Chemistry ............ | 10 | 24 | 12 | 21 | 0 | 11 |
| Quantitative Analysis......... | 19 | 10 | 19 | 10 | 16 | 5 |
| Qualitative Analysis ......... | 26 | 5 | 27 | 10 | 16 | 0 |
| Biochemistry ................. | 5 | 3 | 5 | 3 | 0 | 5 |
| Biological & Medical Sciences: | | | | | | |
| Zoology-Botany-Biology ....... | 13 | 91 | 8 | 90 | 5 | 95 |
| Bacteriology ................. | 39 | 22 | 37 | 23 | 53 | 11 |
| Physiology ................... | 37 | 9 | 37 | 3 | 37 | 5 |
| Anatomy....................... | 35 | 18 | 36 | 19 | 32 | 11 |
| Histology..................... | 23 | 1 | 24 | 1 | 16 | 0 |
| Genetics ..................... | 23 | X[c] | 24 | X[c] | 16 | 0 |
| Embryology ................... | 27 | 2 | 27 | 3 | 32 | 0 |
| Mathematics................... | 17 | 36 | 18 | 40 | 11 | 11 |
| Physics....................... | 8 | 23 | 9 | 23 | 0 | 21 |

a. Registry Forms were sources of data for 173 cytotechnologists who did not have college transcripts in their individual files. The Registry Form is used by the office of the Registry of Medical Technologists (ASCP) as a permanent record summarizing the college science course credit hours taken by applicants for certification examinations. The credit hours for courses with passing grades of A, B, C, and D are transferred from college transcripts to this form. For purposes of this study it is not possible therefore to separate satisfactory (A, B, and C) and unsatisfactory (D and F) performance.

b. This refers to the examination given annually by the Board of Registry of Medical Technologists (ASCP) for certification of cytotechnologists. Of this group of 173 cytotechnologists who took the 1965 certification examination, 154 passed and 19 failed it. These people are represented as "Passing" and "Failing" cytotechnologists in this table.

c. X = Less than 1%.

## TABLE 6

## COLLEGE SCIENCE COURSES TAKEN BY 173 CYTOTECHNOLOGISTS[a]
## According To
## TYPES OF CERTIFICATION[b]

| College Science Courses | Percent of 173[c] Cytotechnologists who took courses | Percent of 153 CT(ASCP) who took courses | Percent of 16 MT(ASCP)CT who took courses |
|---|---|---|---|
| | % | % | % |
| Chemistry: | | | |
| Inorganic Chemistry .............. | 79 | 78 | 94 |
| Organic Chemistry ................ | 35 | 29 | 94 |
| Quantitative Analysis ............ | 29 | 24 | 81 |
| Qualitative Analysis.............. | 30 | 27 | 56 |
| Biochemistry...................... | 8 | 6 | 25 |
| Biological & Medical Sciences: | | | |
| Zoology-Botany-Biology............ | 98 | 99 | 88 |
| Bacteriology...................... | 61 | 58 | 88 |
| Physiology........................ | 46 | 52 | 50 |
| Anatomy .......................... | 54 | 54 | 63 |
| Histology ........................ | 24 | 24 | 25 |
| Genetics.......................... | 24 | 24 | 31 |
| Embryology........................ | 29 | 29 | 38 |
| Mathematics ...................... | 54 | 57 | 31 |
| Physics .......................... | 31 | 28 | 69 |

a. Registry Forms were sources of data for 173 cytotechnologists who did not have college transcripts in their individual files. The Registry Form is used by the office of the Registry of Medical Technologists (ASCP) as a permanent record summarizing the college science course credit hours taken by applicants for certification examinations. The credit hours for courses with passing grades of A, B,C, and D are transferred from college transcripts to this form. For purposes of this study it is not possible therefore to separate satisfactory (A, B, and C) and unsatisfactory (D and F) performance.

b. This refers to the examination given annually by the Board of Registry of Medical Technologists (ASCP) for certification of cytotechnologists.

c. Three of the 173 people were certified as H.T.(ASCP)C.T. Three had courses in zoology-botany-biology. Two had courses in inorganic chemistry, and bacteriology. Courses in quantitative analysis, qualitative analysis, organic chemistry, biochemistry, physiology, anatomy, histology, and mathematics were each taken by one person.

c. One of the 173 people did not pass the certification examination, therefore is not included in any of the certification groups.

## B. PERFORMANCE IN CLINICAL STUDY

The cytotechnologists' clinical study 1/ performance is rated by the director of the program. These evaluations for 358 study participants, filed in the office of the Registry of Medical Technologists (ASCP), are summarized in Table 7 including a tabulation of those who passed and failed the 1965 certification examination for each performance level. These levels are classified as "excellent", "good", "fair", and "poor" for the entire period of study in one institution. The ratings are not divided according to cytotechnology subject matter.

The clinical study program recognized by the Board of Registry of Medical Technologists (ASCP) consists of a minimum of 12 months of study completed in one of two ways: (1) 12 months in one medical laboratory accredited as a school of cytotechnology by the A.M.A. Council on Medical Education; or (2) a combination of 6 months in an accredited school of cytotechnology and at least 6 months in another medical laboratory under the supervision of a physician recognized in the field of cytology. The programs for 45 of the cytotechnologists in this study varied from this scheme because they received their training prior to 1960.2/ Because of this variation in clinical study programs for all of the study participants, 42% (151) of them were evaluated once (on one form) and 58% (207) twice (on two forms).

Almost half (47%) of the cytotechnologists for whom one form was used were evaluated as "good" and slightly fewer (40%) as "excellent". Significantly more of this group who were rated "excellent" passed the 1965 certification examination.

More than half of those evaluated on two forms were rated as "good" during the first half of the study period and "excellent" during the second half. This difference in distribution is statistically significant. Significantly more of those rated above "fair" during the first half of the program passed the examination. The differences in these distributions in the second half of the program are not statistically significant.3/ However, a comparison of ratings on both forms shows that significantly more of those rated above "fair" on both passed the certification examination.

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1/ The term "clinical study" is defined as the period of training in cytotechnology in a medical laboratory which is a prerequisite for applying for the ASCP certification examination. This training was obtained in schools of cytotechnology accredited by the Council on Medical Education of the American Medical Association by 313 of the people in this study. The school of cytotechnology programs vary in length from six through 12 months. The remaining 45 people were trained under the direction of pathologists or other physicians recognized in the field of cytology prior to 1960, before schools were accredited by the A.M.A. Council on Medical Education.

2/ These people were qualified to take the certification examination under the following "grandfather clause" in the Registry requirements:

> "High school graduates who completed six months of training in Exfoliative Cytology previous to January 1, 1960, and whose technical qualifications can be verified by a pathologist or other physician recognized as a specialist in Cytology, may be considered eligible for the examination on subsequent completion of two years of full time experience in cytology."

3/ $X^2 = 0.96$; df = 2, $X^2 = 5.99$ (0.05 probability level)

## TABLE 7

## RATING OF CYTOTECHNOLOGISTS' PERFORMANCE
## In
## CLINICAL STUDY[a]

| Item | Total in Study | | Passed Exam[b] | Failed Exam[b] |
|---|---|---|---|---|
| | N[c] | %[c] | %[d] | %[d] |
| Number and Percent of Cytotechnologists | 358 | 100 | 86 | 14 |
| Performance rating for clinical study[e] | | | | |
| 1. One rating form used for 12 months of study | 151 | 42 | 81 | 19 |
| Rating of Excellent | 61 | 17 | 92[h] | 8 |
| Good | 71 | 19 | 80 | 20 |
| Fair | 17 | 5 | 47 | 53 |
| Poor | 1 | x[f] | 100 | 0 |
| No rating | 1 | x[f] | 0 | 100 |
| 2. Two rating forms used for 12 months of study | 207 | 58 | 89 | 11 |
| a. One form used for first 6 months of study | | | | |
| Rating of Excellent | 59[g] | 16 | 98 | 2 |
| Good | 116 | 32 | 90[i] | 10 |
| Fair | 24 | 7 | 67 | 33 |
| Poor | 2 | x[f] | 50 | 50 |
| No rating | 6 | 2 | 100 | 0 |
| b. One form used for second 6 months of study | | | | |
| Rating of Excellent | 106[g] | 30 | 92 | 8 |
| Good | 76 | 21 | 89[i] | 11 |
| Fair | 18 | 5 | 78 | 22 |
| Poor | 0 | 0 | 0 | 0 |
| No rating | 7 | 2 | 86 | 14 |

a. The term "clinical study" is defined as the period of training in cytotechnology in a medical laboratory which is a prerequisite for applying for the ASCP certification examination. This training was obtained in schools of cytotechnology accredited by the Council on Medical Education of the American Medical Association by 313 of the people in this study. The school of cytotechnology programs vary in length from six through 12 months. The remaining 45 people were trained under the direction of pathologists or other physicians recognized in the field of cytology prior to 1960, before schools were accredited by the A.M.A. Council on Medical Education.

b. The terms "Passed Exam" and "Failed Exam" refer to passing and failing the 1965 certification examination for cytotechnologists given by the Registry of Medical Technologists (ASCP).

c. The summations of N (number) and % (percent) for the Total in the Study follow the vertical dimension of the table. All percents are based on 358 people.

d. The summations of % (percent) for the Passed Exam and Failed Exam groups follow the horizontal dimension of the table. The percents are based on the N (number) in the corresponding parallel column. For example: 61 of the people were rated excellent on one form of whom 92% passed the 1965 certification examination and 8% failed.

e. One rating form was used for those people who completed their training program in one institution (usually 12 months).
Two rating forms were used for those people who completed their training program in two institutions (usually six months in each institution).

## Footnotes for Table 7
(continued)

f. X = Less than 1%.

g. Calculation of chi square test for distribution shows that these figures are statistically significant because the frequency of replies exceeds the 0.05 probability level. The Kolmogorov-Smirnov formula was used.
$X^2 = 22.34$; df = 2, $X^2 = 5.99$

h. Calculation of chi square test for distribution using the Kolmogorov-Smirnov formula. 0.05 probability level.
$X^2 = 7.50$; df = 2, $X^2 = 5.99$

i. Calculation of chi square test for distribution using the Kolmogorov-Smirnov formula. 0.05 probability level.
$X^2 = 7.14$; df = 2, $X^2 = 5.99$

# C. CHARACTERISTICS OF SCHOOLS OF CYTOTECHNOLOGY

The cytotechnologists surveyed were enrolled for clinical study in laboratories accredited as schools of cytotechnology by the Council on Medical Education of the American Medical Association. The Board of Schools of Medical Technology of the American Society of Clinical Pathologists, with advice from a special committee, assists the Council in the accredition of these laboratories. Information about the 82 schools accredited in 1964-65 was obtained from the school directors' annual reports for that period which are filed in the office of the Board of Schools of Medical Technology (ASCP). Eighty-seven percent (313) of the 358 cytotechnologists attended 72 of the 82 accredited schools.

The characteristics of the schools of cytotechnology are presented in Table 8 as they apply to two populations. The first is composed of the 82 schools as individual institutions or programs. The second is represented by the 313 cytotechnologists who attended 72 of the 82 institutions. The latter population (313) was derived to enable identification and comparison of the separate characteristics represented by the people who passed the 1965 certification examination and those who failed it. The distribution of replies for the second population may appear to be magnified because of the number of students attending individual schools. For a particular characteristic, a comparison of the number and percent of individual schools and the number and percent represented by the cytotechnologists will enable the reader to account for the extent to which the response frequency has been affected. The following summary of school characteristics is based on the first population, except when referring to comparisons of those represented by students who passed and failed the certification examination.

## LOCATION

The schools of cytotechnology were located in 32 states, the District of Columbia and Puerto Rico. Those having the largest number were North Carolina (10%), Ohio (10%), Pennsylvania (10%), New York (6%) and Texas (6%). The schools represented by students who failed the 1965 certification examination were located in 17 of the 32 states, the District of Columbia and Puerto Rico. Those in Georgia, North Carolina, Ohio, Tennessee and Texas had a larger percent of students who failed the examination than the norm for the entire group.1/

## SIZE

The school size is classified according to accredited capacity, enrollment and number of students graduating. Approximately half (44%-52%) of the schools had one through four students and slightly more than one-fourth (27%-28%) had five through eight students in these three classifications. The schools accredited for, enrolling and graduating from five through eight students had a larger percent of students who passed the certification examination than the norm for the entire group.1/

## STAFF

Almost all (95%) of the school directors were certified either in anatomic pathology or in both clinical and anatomic pathology. The schools directed by those certified only in anatomic pathology had a higher than normal percent of students who passed the certification examination.1/

Three-fourths of the schools had teaching supervisors who were certified as C.T.(ASCP) and almost all of the remainder were M.T.(ASCP), most of whom were also C.T.(ASCP). The percent of the latter group with students who failed the certification examination was higher than normal.1/

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1/ The chi square test for distribution could not be applied in all instances in this section on schools because the N in several of the fail groups is less than 5. The distribution of 87% of the group passing and 13% failing the 1965 certification examination constitutes the norm for the entire group.

More than one-third (37%) of the teaching supervisors had from six through ten years of experience. The length of experience for almost half of them was divided between three and five years (27%) and 11 through 15 years (22%). Those with supervisors having five years or less experience had a higher than normal percent of students failing whereas those with 11 through 15 years had a higher than normal percent passing the 1965 certification examination. The annual reports did not specify the nature of this experience.

Almost half (43%) of the teaching supervisors had Bachelor's degrees and training in cytotechnology. Somewhat fewer (39%) had cytotechnology training but no academic degrees. The group with higher than normal percent of passing students had only cytotechnology experience (no formal training) whereas those with higher percent of failing students had Master's degrees and cytotechnology training.

Technical assistants [1] and people certified as C.T.(ASCP) who may or may not have academic degrees comprise the staff for about three-fourths of the schools. Slightly more than one-third (38%) of the schools had technical personnel who had academic degrees but were not ASCP-certified. There is a tendency for the schools with from three through five people in each of the personnel categories to have a higher than normal percent of students who passed the 1965 certification examination.

## EDUCATION PROGRAM

About half (46%) of the schools were initially accredited by the A.M.A. Council on Medical Education between 1958 and 1960.[2] The admission requirement was two years of college for all but five of the schools. The latter stipulated either three or four years.

The program in two-thirds of the schools was six months in length and in almost all of the remaining schools was 12 months. As may be expected, consequently, the students in almost two-thirds (62%) of the schools spent from 840 through 1,040 hours in the training program, and those in most of the remainder (28%) spent up to 2,080 hours. Significantly more of the students in programs requiring up to 2,080 hours passed the certification examination, whereas more of those in programs requiring an excess of 2,080 hours failed the 1965 certification examination. Almost two-thirds of the schools divided their programs so that the students had a maximum of 260 hours of didactic instruction (62%) and from 521 through 1,000 hours of practical instruction (59%). There is a higher percent of students than normal from these particular programs who passed the certification examination.

Almost three-fourths (71%) of the schools had a laboratory workload of from 10,000 through 50,000 cases for cytologic examination. Those with from 20,000 through 50,000 had a higher percent of students passing the examination than normal. The major portion of cases was classified as female genital with the remainder from the respiratory tract, effusions, gastrointestinal and urinary tracts and breast (in decreasing order of case volume).

Almost all (93%) of the schools gave certificates to students completing their programs.

## FINANCES

The students in one-fourth of the schools paid tuition. Those in almost three-fourths (73%) of the schools received stipends. Student scholarships were available in about one-third (37%) of the schools. Most of the stipends and scholarships were for $225 per month which is the amount given by the American Cancer Society and U.S. Public Health Service. It is difficult to ascertain the source of this student aid, however, because it was indicated by only a limited number of schools.

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[1] The term "technical assistant" was not defined in the annual reports.

[2] The Board of Schools of Medical Technology (ASCP) started accrediting schools in 1958. This activity was transferred to the A.M.A. Council on Medical Education in 1963. The A.M.A. Council is assisted by the Board of Schools in conducting the accreditation program. The years appearing in the table are those given by the school directors on the annual report forms.

## TABLE 8

## CHARACTERISTICS OF SCHOOLS OF CYTOTECHNOLOGY

| Item | All Schools of Cytotechnology | | 72 Schools of Cytotechnology Represented by 313 Cytotechnologists[a] | | | |
|---|---|---|---|---|---|---|
| | | | Total in Study | | Passed Exam | Failed Exam |
| | N[b] | %[b] | N[c] | %[c] | %[d] | %[d] |
| Number and percent of schools of cytotechnology........................ | 82 | 100 | 313 | 100 | 87 | 13 |
| 1. Location of Schools | | | | | | |
| California .................. | 4 | 5 | 25 | 8 | 88 | 12 |
| Colorado .................... | 1 | 1 | 7 | 2 | 86 | 14 |
| District of Columbia ....... | 1 | 1 | 2 | X[m] | 0 | 100 |
| Georgia...................... | 2 | 2 | 5 | 2 | 60 | 40 |
| Illinois .................... | 2 | 2 | 16 | 5 | 100 | 0 |
| Indiana...................... | 2 | 2 | 4 | 1 | 75 | 25 |
| Louisiana.................... | 1 | 1 | 10 | 3 | 90 | 10 |
| Michigan .................... | 2 | 2 | 7 | 2 | 86 | 14 |
| Missouri .................... | 1 | 1 | 1 | X[m] | 0 | 100 |
| Nebraska .................... | 1 | 1 | 6 | 2 | 83 | 17 |
| New York .................... | 5 | 6 | 19 | 6 | 100 | 0 |
| North Carolina .............. | 8 | 10 | 26 | 8 | 73 | 27 |
| Ohio ........................ | 8 | 10 | 16 | 5 | 75 | 25 |
| Oklahoma .................... | 1 | 1 | 9 | 3 | 89 | 11 |
| Pennsylvania ................ | 8 | 10 | 28 | 9 | 82 | 18 |
| Tennessee.................... | 2 | 2 | 14 | 4 | 71 | 29 |
| Texas........................ | 5 | 6 | 15 | 5 | 80 | 20 |
| Virginia .................... | 3 | 4 | 14 | 4 | 93 | 7 |
| Washington .................. | 3 | 4 | 7 | 2 | 86 | 14 |
| West Virginia................ | 1 | 1 | 7 | 2 | 86 | 14 |
| Puerto Rico.................. | 1 | 1 | 6 | 2 | 83 | 17 |
| Other[e] .................... | 20 | 24 | 69 | 22 | 100 | 0 |
| 2. Schools initially accredited in | | | | | | |
| 1948 through 1957........... | 11 | 13 | 55 | 18 | 82 | 18 |
| 1958 through 1960........... | 38 | 46 | 160 | 51 | 88 | 12 |
| 1961 through 1965........... | 33 | 40 | 98 | 31 | 88 | 12 |
| 3. School Director | | | | | | |
| a. Certified in | | | | | | |
| anatomic pathology only ..... | 35 | 43 | 140 | 45 | 90 | 10 |
| clinical pathology only ..... | 0 | 0 | 0 | 0 | 0 | 0 |
| anatomic & clinical pathology | 43 | 52 | 162 | 52 | 83 | 17 |
| neither given | 4 | 5 | 11 | 4 | 100 | 0 |
| b. Change in director during the year | | | | | | |
| Yes .......................... | 10 | 12 | 36 | 12 | 92 | 8 |
| No............................ | 70 | 85 | 275 | 88 | 87 | 13 |
| No reply...................... | 2 | 2 | 2 | X[m] | 50 | 50 |

TABLE 8
(continued)

| Item | All Schools of Cytotechnology | | 72 Schools of Cytotechnology Represented by 313 Cytotechnologists[a] | | | |
|---|---|---|---|---|---|---|
| | | | Total in Study | | Passed Exam | Failed Exam |
| | N[b] | %[b] | N[c] | %[c] | %[d] | %[d] |
| 4. Teaching supervisor | | | | | | |
| a. Certified as | | | | | | |
| C.T.(ASCP) | 62 | 76 | 248 | 79 | 88 | 12 |
| M.T.(ASCP)C.T. | 11 | 13 | 26 | 8 | 73 | 27 |
| M.T.(ASCP) | 5 | 6 | 24 | 8 | 88 | 12 |
| M.D | 3 | 4 | 14 | 4 | 93 | 7 |
| None | 1 | 1 | 1 | X[m] | 0 | 100 |
| b. Years of experience[f] | | | | | | |
| 3 through 5 years | 22 | 27 | 68 | 22 | 79 | 21 |
| 6 through 10 years | 30 | 37 | 113 | 36 | 90 | 10 |
| 11 through 15 years | 18 | 22 | 70 | 22 | 93 | 7 |
| 16 through 20 years | 8 | 10 | 41 | 13 | 83 | 17 |
| 21 years or more[f] | 1 | 1 | 16 | 5 | 81 | 19 |
| No reply | 3 | 4 | 5 | 2 | 80 | 20 |
| c. Academic preparation | | | | | | |
| Cytotechnology experience only | 5 | 6 | 19 | 6 | 90 | 10 |
| No degree, cytotech. training | 32 | 39 | 121 | 39 | 87 | 13 |
| Bachelor's degree, cytotech. training | 35 | 43 | 127 | 41 | 88 | 12 |
| Master's degree, cytotech. training | 5 | 6 | 26 | 8 | 77 | 23 |
| M.D | 3 | 4 | 14 | 4 | 93 | 7 |
| Other[g] | 2 | 2 | 6 | 2 | 83 | 17 |
| 5. Certificate granted by schools | | | | | | |
| Yes | 76 | 93 | 297 | 95 | 87 | 13 |
| No | 5 | 6 | 15 | 5 | 93 | 7 |
| No reply | 1 | 1 | 1 | 1 | 100 | 0 |
| 6. Tuition charged by schools | | | | | | |
| Yes | 20 | 24 | 101 | 32 | 88 | 12 |
| No | 57 | 70 | 191 | 61 | 86 | 14 |
| No reply | 5 | 6 | 21 | 7 | 91 | 9 |
| 7. Stipend paid by schools | | | | | | |
| Yes | 60 | 73 | 264 | 84 | 88 | 12 |
| No | 21 | 26 | 48 | 15 | 83 | 17 |
| No reply | 1 | 1 | 1 | X[m] | 100 | 0 |
| 8. Scholarship awarded by schools | | | | | | |
| Yes | 30 | 37 | 127 | 41 | 89 | 11 |
| No | 51 | 62 | 183 | 58 | 86 | 14 |
| No reply | 1 | 1 | 3 | 1 | 67 | 33 |
| 9. Room &/or board provided by schools | | | | | | |
| Yes | 15 | 18 | 45 | 14 | 87 | 13 |
| No, none | 67 | 82 | 268 | 86 | 87 | 13 |

TABLE 8
(continued)

| Item | All Schools of Cytotechnology | | 72 Schools of Cytotechnology Represented by 313 Cytotechnologists[a] | | | |
|---|---|---|---|---|---|---|
| | | | Total in Study | | Passed Exam | Failed Exam |
| | N[b] | %[b] | N[c] | %[c] | %[d] | %[d] |
| 10. Technical staff in schools | | | | | | |
| a. With degree: C.T.(ASCP) ... | 61 | 74 | 252 | 81 | 87 | 13 |
| 1 person .................... | 29 | 35 | 95 | 30 | 86 | 14 |
| 2 people .................... | 15 | 18 | 67 | 21 | 81 | 19 |
| 3 through 5 people .......... | 15 | 18 | 76 | 24 | 90 | 10 |
| 6 people or more[h] ........... | 2 | 2 | 14 | 5 | 100 | 0 |
| 0 people .................... | 21 | 26 | 61 | 19 | 89 | 11 |
| b. With degree: Non-ASCP ..... | 31 | 38 | 116 | 37 | 89 | 11 |
| 1 person .................... | 13 | 16 | 49 | 16 | 92 | 8 |
| 2 people .................... | 6 | 7 | 22 | 7 | 77 | 23 |
| 3 through 5 people[h] ......... | 12 | 15 | 45 | 14 | 91 | 9 |
| 0 people .................... | 51 | 62 | 197 | 63 | 86 | 14 |
| c. Without degree: C.T.(ASCP) | 58 | 71 | 245 | 78 | 88 | 12 |
| 1 person .................... | 23 | 28 | 77 | 25 | 86 | 14 |
| 2 people .................... | 18 | 22 | 71 | 23 | 86 | 14 |
| 3 through 5 people .......... | 15 | 18 | 75 | 24 | 95 | 5 |
| 6 people or more[h] ........... | 2 | 2 | 22 | 7 | 82 | 18 |
| 0 people .................... | 24 | 29 | 68 | 22 | 82 | 18 |
| d. Other technical assistants | 58 | 71 | 197 | 63 | 86 | 14 |
| 1 person .................... | 27 | 33 | 78 | 25 | 81 | 19 |
| 2 people .................... | 19 | 23 | 65 | 21 | 85 | 15 |
| 3 through 5 people .......... | 8 | 10 | 34 | 11 | 91 | 9 |
| 6 people or more[h] ........... | 4 | 5 | 20 | 6 | 100 | 0 |
| 0 people .................... | 24 | 29 | 116 | 37 | 89 | 11 |
| e. Other employees in schools | 52 | 63 | 229 | 73 | 90 | 10 |
| 1 person .................... | 34 | 42 | 137 | 44 | 88 | 12 |
| 2 people .................... | 7 | 9 | 38 | 12 | 97 | 3 |
| 3 through 5 people .......... | 9 | 11 | 43 | 14 | 84 | 16 |
| 6 people or more[h] ........... | 2 | 2 | 11 | 4 | 100 | 0 |
| 0 people .................... | 30 | 37 | 84 | 27 | 80 | 20 |
| 11. Years of college required for admission | | | | | | |
| 2 years.......................... | 77 | 94 | 291 | 93 | 88 | 12 |
| 3 years.......................... | 2 | 2 | 3 | 1 | 0 | 100 |
| 4 years.......................... | 3 | 4 | 19 | 6 | 90 | 10 |
| 12. Length of training | | | | | | |
| 6 months........................ | 54 | 66 | 208 | 66 | 89 | 11 |
| 12 months........................ | 23 | 28 | 90 | 29 | 82 | 18 |
| 6 through 12 months ........... | 5 | 6 | 15 | 5 | 93 | 7 |

TABLE 8
(continued)

| Item | All Schools of Cytotechnology | | 72 Schools of Cytotechnology Represented by 313 Cytotechnologists[a] | | | |
|---|---|---|---|---|---|---|
| | | | Total in Study | | Passed Exam | Failed Exam |
| | N[b] | %[b] | N[c] | %[c] | %[d] | %[d] |
| 13. Hours spent in training | | | | | | |
| a. Total | | | | | | |
| 840 through 1040 hours..... | 51 | 62 | 157 | 50 | 96 | 4 |
| 1041 through 2080 hours..... | 21 | 26 | 78 | 25 | 92[n] | 8[n] |
| 2081 hours or more[i]......... | 6 | 7 | 10 | 3 | 60[n] | 40[n] |
| Other[j] ..................... | 1 | 1 | 8 | 3 | 88 | 13 |
| No reply .................... | 3 | 3 | 60 | 19 | 60 | 40 |
| b. Didactic instruction | | | | | | |
| 0 hours.................... | 3 | 4 | 10 | 3 | 90 | 10 |
| 1 through 130 hours....... | 31 | 38 | 102 | 33 | 85 | 15 |
| 131 through 260 hours....... | 20 | 24 | 73 | 23 | 90 | 10 |
| 261 through 520 hours....... | 13 | 16 | 49 | 16 | 84 | 16 |
| 521 hours or more[i] ......... | 15 | 18 | 79 | 25 | 87 | 13 |
| c. Practical instruction | | | | | | |
| 0 hours.................... | 3 | 4 | 10 | 3 | 90 | 10 |
| 1 through 520 hours....... | 14 | 17 | 63 | 20 | 83 | 17 |
| 521 through 1000 hours ..... | 48 | 59 | 141 | 45 | 91 | 9 |
| 1001 hours or more[i] ......... | 17 | 21 | 99 | 32 | 84 | 16 |
| 14. Number of students per school | | | | | | |
| a. Accredited capacity in 1964 | | | | | | |
| 1 through 4 students ....... | 43 | 52 | 100 | 32 | 86 | 14 |
| 5 through 8 students ....... | 22 | 27 | 107 | 34 | 92 | 8 |
| 9 students or more[k]......... | 17 | 21 | 106 | 34 | 83 | 17 |
| b. Enrollment in 1964 | | | | | | |
| 0 students ................. | 10 | 12 | 17 | 5 | 82 | 18 |
| 1 through 4 students ....... | 36 | 44 | 95 | 30 | 81 | 19 |
| 5 through 8 students ....... | 22 | 27 | 92 | 29 | 91 | 9 |
| 9 students or more[k]......... | 14 | 17 | 109 | 35 | 89 | 11 |
| c. Graduating in 1965 | | | | | | |
| 0 students ................. | 13 | 16 | 26 | 8 | 85 | 15 |
| 1 through 4 students ....... | 36 | 44 | 108 | 35 | 84 | 16 |
| 5 through 8 students ....... | 23 | 28 | 99 | 32 | 92 | 8 |
| 9 students or more[k]......... | 10 | 12 | 80 | 26 | 85 | 15 |
| 15. Number of cases processed in lab. in 1964 | | | | | | |
| a. Female Genital | | | | | | |
| 500 through 10,000 cases | 29 | 35 | 111 | 35 | 87 | 13 |
| 10,001 through 20,000 cases | 31 | 38 | 101 | 32 | 84 | 16 |
| 20,001 through 30,000 cases | 11 | 13 | 43 | 14 | 93 | 7 |
| 30,001 cases or more[l]....... | 11 | 13 | 58 | 19 | 88 | 12 |

TABLE 8
(continued)

| Item | All Schools of Cytotechnology | | 72 Schools of Cytotechnology Represented by 313 Cytotechnologists[a] | | | |
|---|---|---|---|---|---|---|
| | | | Total in Study | | Passed Exam | Failed Exam |
| | N[b] | %[b] | N[c] | %[c] | %[d] | %[d] |
| 15. Number of cases processed in lab. in 1964 (continued) | | | | | | |
| b. Respiratory tract | | | | | | |
| 34 through 500 cases... | 35 | 43 | 120 | 38 | 86 | 14 |
| 501 through 1,000 cases... | 18 | 22 | 66 | 21 | 82 | 18 |
| 1,001 cases or more[l] ....... | 29 | 35 | 127 | 41 | 91 | 9 |
| c. Gastrointestinal tract | | | | | | |
| 0 cases.................... | 4 | 5 | 16 | 5 | 75 | 25 |
| 2 through 50 cases....... | 33 | 40 | 91 | 29 | 87 | 13 |
| 51 through 100 cases....... | 18 | 22 | 85 | 27 | 82 | 18 |
| 101 through 500 cases....... | 24 | 29 | 110 | 35 | 94 | 6 |
| 501 cases or more[l] ......... | 3 | 4 | 11 | 4 | 73 | 27 |
| d. Effusions | | | | | | |
| 0 cases.................... | 1 | 1 | 2 | X[m] | 100 | 0 |
| 20 through 100 cases....... | 33 | 40 | 101 | 32 | 82 | 18 |
| 101 through 200 cases....... | 25 | 30 | 98 | 31 | 92 | 8 |
| 201 through 500 cases....... | 20 | 24 | 93 | 30 | 86 | 14 |
| 501 cases or more[l] ......... | 3 | 4 | 19 | 6 | 90 | 10 |
| e. Urinary tract | | | | | | |
| 0 cases.................... | 1 | 1 | 4 | 1 | 75 | 25 |
| 34 through 50 cases....... | 43 | 52 | 138 | 44 | 83 | 17 |
| 51 through 100 cases....... | 16 | 20 | 76 | 24 | 88 | 12 |
| 101 through 500 cases....... | 18 | 22 | 84 | 27 | 91 | 9 |
| 501 cases or more[l] ......... | 4 | 5 | 11 | 4 | 100 | 0 |
| f. Breast | | | | | | |
| 0 cases .................... | 8 | 10 | 29 | 9 | 86 | 14 |
| 2 through 25 cases......... | 40 | 49 | 144 | 46 | 87 | 13 |
| 26 through 50 cases......... | 16 | 20 | 70 | 22 | 87 | 13 |
| 51 cases or more[l]........... | 18 | 22 | 69 | 22 | 87 | 13 |
| g. Total number of cases processed in 1964 | | | | | | |
| 3,800 through 10,000 cases | 23 | 28 | 77 | 25 | 86 | 14 |
| 10,001 through 20,000 cases | 36 | 44 | 134 | 43 | 85 | 15 |
| 20,001 through 50,000 cases | 22 | 27 | 83 | 27 | 92 | 8 |
| 50,001 cases or more[l]....... | 2 | 2 | 19 | 6 | 84 | 16 |

a. The characteristics of schools of cytotechnology are presented as they apply to two populations: (1) 82 schools as individual institutions or programs; (2) 313 schools represented by 313 people who attended the 72 individual institutions. The latter population (313) was derived to enable a comparison of the separate characteristics represented by the people who passed the 1965 certification examination and those who failed. Duplication of particular characteristics can be identified by associating the N (number) for the "Schools of Cytotechnology" (82) with the N (number) for the "Total in Study" (313). For example: 4 Schools of Cytotechnology in California are represented by 25 schools attended by 25 people.

## Footnotes for Table 8
(continued)

b. The summation of N (number) and % (percent) for the Schools of Cytotechnology follow the vertical dimension of the table. All percents are based on 82 schools.

c. The summations of N (number) and % (percent) for the Total in Study follow the vertical dimension of the table. All percents are based on 313 schools.

d. The summations of % (percent) for the Pass and Fail groups follow the horizontal dimension of the table. The percents are based on the N (number) in the corresponding parallel column (Total in Study). For example: 25 of the programs are located in California of which 88% represent the people who passed the 1965 certification examination and 12% represent those who failed.

e. "Other" includes 13 states each of which represents less than 5% of the Total and Pass groups.

f. The report form providing information about the schools did not specify the type of experience, i.e. that it was restricted to cytotechnology. The maximum number of years of experience for the Total and Pass groups is 23, for the Fail is 20. The minimum number of years of experience for all three groups is 2.

g. "Other" includes 2 people who both had a combination of Master's degree and formal training as medical technologists and cytotechnologists.

h. The maximum number of people for each category is as follows:

| | |
|---|---|
| With degree: C.T.(ASCP) | 9 for Total and Pass groups<br>4 for Fail group |
| With degree: Non-ASCP | 5 for Total, Pass and Fail groups |
| Without degree: C.T.(ASCP) | 8 for Total, Pass and Fail groups |
| Other technical assistants | 10 for Total and Pass groups<br>3 for Fail group |
| Other employees | 7 for Total and Pass groups<br>5 for Fail groups |

i. The maximum number of hours spent in training is as follows:

| | |
|---|---|
| Total | 2,400 for Total, Pass and Fail groups |
| Didactic training | 1,040 for Total, Pass and Fail groups |
| Practical training | 2,200 for Total, Pass and Fail groups |

The minimum number of hours spent in training is as follows:

| | |
|---|---|
| Total | 840 for Total, Pass and Fail groups |
| Didactic training | 10 for Total, Pass and Fail groups |
| Practical training | 30 for Total, Pass and Fail groups |

j. "Other" indicates a reply of "40 hours per week".

k. The maximum number of students is as follows:

| | |
|---|---|
| Accredited capacity | 20 for Total, Pass and Fail groups |
| Enrolled | 18 for Total, Pass and Fail groups |
| Graduating | 18 for Total, Pass and Fail groups |

The minimum number of students for each of the three categories and groups is one.

## Footnotes for Table 8
(continued)

l. The range of the number of cases per program is as follows:

| | | |
|---|---|---|
| Female Genital | Total group | 500 - 97,900 |
| | Pass group | 500 - 97,900 |
| | Fail group | 3,100 - 55,900 |
| Respiratory tract | Total group | 34 - 7,000 |
| | Pass group | 34 - 7,000 |
| | Fail group | 50 - 4,000 |
| Gastrointestinal tract | Total group | 2 - 1,200 |
| | Pass group | 2 - 1,200 |
| | Fail group | 5 - 1,200 |
| Effusions | Total group | 20 - 745 |
| | Pass group | 20 - 745 |
| | Fail group | 25 - 745 |
| Urinary tract | Total group | 1 - 577 |
| | Pass group | 1 - 577 |
| | Fail group | 9 - 348 |
| Breast | Total group | 2 - 160 |
| | Pass group | 2 - 160 |
| | Fail group | 2 - 160 |
| Total cases | Total group | 3,800 -104,000 |
| | Pass group | 3,800 -104,000 |
| | Fail group | 3,800 - 65,300 |

It is possible that many of the figures apply to slides rather than cases even though the annual report form requested cases.

m. X = Less than 1%.

n. Calculation of chi square test for distribution shows that these figures are statistically significant because the frequency of replies exceeds the 0.05 probability level.
$X^2 = 13.70$; df = 1, $X^2 = 3.84$

# D. PERFORMANCE IN CERTIFICATION EXAMINATION

Raw scores and other information related to the 1965 certification examination were obtained from the office of the Registry of Medical Technologists (ASCP). The examination consisted of two sections: (1) 40 multiple choice and 12 matching questions worth 100 points relating to cell morphology, pertinent basic science, epidemiology, and techniques ("written" section); (2) 25 micro slides worth 100 points for cytologic interpretation ("practical" section).

The entire examination is prepared by a committee of pathologists who also arrange the practical section schedule throughout the country. Candidates are required to provide their own microscopes and lamps for the practical examination. Both sections are scored in the Registry office using answer keys provided by the committee.

The cytotechnology consultants to the study staff reviewed the content of the questions in the written section. They agreed that 48 points related to cell morphology, 40 to pertinent basic science, 3 to epidemiology, and 9 to techniques. Since the practical section (100 points) requires a knowledge of morphology for cytologic interpretation, it is estimated that the total 200 points for the examination are distributed as follows: 74% cell morphology, 20% pertinent basic science, 1.5% epidemiology, and 4.5% techniques.

The raw score analysis reflects the performance required for passing the examination and thus becoming certified. Each candidate must receive a passing score in both sections of the examination, written and practical, in order to be certified. Of the 51 people who failed the 1965 examination, 20 passed the written and failed the practical, 25 failed the written and passed the practical, and 6 failed both sections.

The analysis of examination scores is given in Table 9. The minimum raw score for passing the written section is 56 points. The mean raw score is 71.7 points with a range of 25 through 94 points. The mean raw score for those who passed this section is 74.2 points with a range of 56 through 94 points. For those who failed, the mean raw score is 56.6 points with a range of 25 through 77 points.

The minimum raw score for passing the practical section is 70 points. The mean raw score is 80.2 points with a range of 43 through 97 points. The mean raw score for those who passed this section is 81.9 points with a range of 70 through 97 points. For those who failed this section, the mean raw score is 69.9 points with a range of 43 through 89 points.

Table 10 contains information about the candidates for the 1965 certification examination. Eighty-seven percent (311) of the 358 candidates took the written section for the first time and the remainder for the second, third and fifth times. Significantly more of those attempting this for the second time failed the 1965 certification examination. Almost all (97%) of the candidates took the practical section for the first time. The discrepancy occurs because prior to 1965 the candidates were required to pass the written section of the examination before attempting the practical. The policy changed in 1965 and required that all candidates take both sections in the same examination period regardless of their performance on separate sections.

Almost half (48%) of the candidates started their clinical study in 1963 and about one-third (29%) between 1958 and 1962. Significantly more of those who began their clinical study between 1958 and 1961 failed the 1964 certification examination.

Women comprised 85% (304) of the applicants and men 15% (54). Significantly more of the men (13) failed the examination. It is noteworthy that these same men are included in the fail group of 19 people who started their clinical study between 1958 and 1961.

One-fourth of the candidates indicated that they had teaching duties in cytotechnology at the time they applied for the 1965 certification examination.

## TABLE 9

## 1965 CERTIFICATION EXAMINATION PERFORMANCE

| Item | Total in Study | Passed Exam[a] | Failed Exam[a] |
|---|---|---|---|
| Number of Cytotechnologists .................... | 358 | 307 | 51 |
| Written section raw score | | | |
| Range ...................................... | 25 - 94 | 56 - 94 | 25 - 77 |
| Mean........................................ | 71.7 | 74.2 | 56.6 |
| Median...................................... | 73 | 74 | 54 |
| Mode........................................ | 74 | 74 | 55 |
| Maximum points possible .................... | 100 | | |
| Minimum points needed to pass the section .. | 56 | | |
| Practical section raw score | | | |
| Range ...................................... | 43 - 97 | 70 - 97 | 43 - 89 |
| Mean........................................ | 80.2 | 81.9 | 69.9 |
| Median...................................... | 81 | 82 | 68 |
| Mode........................................ | 84 | 84 | 71 |
| Maximum points possible .................... | 100 | | |
| Minimum points needed to pass the section .. | 70 | | |

a. Each candidate must receive a passing score in both sections, written and practical, in order to be certified.

## TABLE 10

### INFORMATION FROM
### 1965 CERTIFICATION EXAMINATION APPLICATION FORMS

| Item | Total in Study | | Passed Exam[a] | Failed Exam[a] |
|---|---|---|---|---|
| | N[b] | %[b] | %[c] | %[c] |
| Number and percent of cytotechnologists.......... | 358 | 100 | 86 | 14 |
| 1. Attempts to take certification examination | | | | |
| a. Written section | | | | |
| First attempt............................ | 311 | 87 | 87 | 13 |
| Second attempt .......................... | 40 | 11 | 70 | 30[d] |
| Third and fifth attempts ................ | 7 | 2 | 100 | 0 |
| b. Practical section | | | | |
| First attempt............................ | 346 | 97 | 86 | 14 |
| Second attempt .......................... | 12 | 3 | 67 | 33 |
| 2. Year clinical study started | | | | |
| 1926 through 1957........................ | 27 | 8 | 93 | 7 |
| 1958 through 1961........................ | 56 | 16 | 66 | 34[e] |
| 1962 .................................... | 45 | 13 | 87 | 13 |
| 1963 .................................... | 173 | 48 | 90 | 10 |
| 1964 .................................... | 57 | 16 | 90 | 10 |
| 3. Sex of applicants | | | | |
| a. Female ................................ | 304 | 85 | 88 | 12 |
| Single .................................. | 175 | 49 | 86 | 14 |
| Married.................................. | 129 | 36 | 90 | 10 |
| b. Male ................................. | 54 | 15 | 76 | 24[f] |
| 4. Teaching cytotechnology at time of application for 1965 examination | | | | |
| Yes...................................... | 85 | 24 | 87 | 13 |
| No ...................................... | 112 | 31 | 88 | 12 |
| No reply ................................ | 161 | 45 | 84 | 16 |

a. The terms "Passed Exam" and "Failed Exam" refer to passing and failing the 1965 certification examination for cytotechnologists given by the Registry of Medical Technologists (ASCP).

b. The summations of N (number) and % (percent) for the Total in the Study follow the vertical dimension of the table. All percents are based on 358 people.

c. The summations of % (percent) for the Passed Exam and Failed Exam groups follow the horizontal dimension of the table. The percents are based on the N (number) in the corresponding parallel column. For example: 311 people were making the first attempt on the written section of whom 87% passed and 13% failed it.

d. Calculation of chi square test for distribution shows that these figures are statistically significant because the frequency of replies exceeds the 0.05 probability level.
$X^2 = 8.71$; df = 1, $X^2 = 3.84$

e. Calculation of chi square test for distribution. 0.05 probability level.
$X^2 = 19.55$; df = 1, $X^2 = 3.84$

f. Calculation of chi square test for distribution. 0.05 probability level.
$X^2 = 5.03$; df = 1, $X^2 = 3.84$

# E. CHARACTERISTICS OF CYTOTECHNOLOGISTS

The 358 cytotechnologists selected for this study constitute the entire group that took the certification examination for cytotechnologists given by the Board of Registry of Medical Technologists (ASCP) in 1965. This is the largest group for a single examination since the first was given in 1957. Questionnaires were sent in July 1967 to all of these cytotechnologists by the National Council on Medical Technology Education.1/ They were returned by 70% (249) of the cytotechnologists of whom 89% (222) had passed and 11% (27) had failed the certification examination. Information from these questionnaires is compiled in the following tables: Table 11 contains the working environment characteristics, Table 12 the educational background, Tables 13 through 17 the education and job experiences in quality control measures, and Table 18 the education and job experiences in technical procedures.

## Working Environment

### LOCATION

The 249 cytotechnologists worked in 42 states, the District of Columbia, Puerto Rico and Canada. The largest groups worked in California (12%) and New York (8%). In Missouri, North Carolina, Pennsylvania, Tennessee and Virginia there were more who failed the certification examination than the norm for the entire group.2/ Two-thirds of all of the cytotechnologists were working in the state in which they received their training.

### EXPERIENCE

The total working experience for two-thirds of the cytotechnologists was four years or longer. Significantly more of those with five years or more total working experience failed the certification examination. Employment turnover is indicated by the tenure of the cytotechnologists' appointments. Nineteen percent of them worked at their present places of employment for one year or less, 14% for two years, 27% for three years, 18% for four years, and 14% for five years or longer. One-fourth had held their current positions for one year or less, 16% for two years, 22% for three years, 14% for four years, and 12% for five years or longer. Although more of those staying at the same place of employment and in the same position for five years or longer failed the 1965 certification examination, the distribution is not statistically significant.3/

### TYPE OF LABORATORY

Eighty-eight percent (220) of the cytotechnologists were employed full time. Most of them worked day hours only (no weekend or night schedule) in hospital laboratories and spent all of their time in cytology departments. Some of the cytotechnologists also worked in other laboratory departments such as hematology, chemistry, microbiology and blood bank, however less than 10% worked in any one of them.

Sixteen percent (41) of the 249 cytotechnologists indicated part time employment. Of this group, 12 people stated that they had both full and part time positions. About half of those working part time did so during the day and half had schedules including day, night and/or weekend hours. The same portion worked in hospitals and independent laboratories. Somewhat more than half of this group spent all of their time in cytology departments.

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1/ A copy of the questionnaire is in the Appendix.

2/ The chi square test for distribution could not be applied in all instances because the N in several of the fail groups is less than 5. The distribution of 89% of the group passing and 11% failing the 1965 certification constitutes the norm (normal) for this population.

3/ $X^2 = 3.95$; df = 4, $X^2 = 9.49$ (Place of employment) (0.05 probability level)
$X^2 = 5.78$; df = 4, $X^2 = 9.49$ (Position) (0.05 probability level)

The mean bed capacity of the hospitals in which 140 of the 165 cytotechnologists worked is 537. The mean bassinet capacity for 123 of these hospitals is 51.1/

Most (87%) of the 249 cytotechnologists had laboratory directors who were pathologists, almost all of whom had full time positions. Almost all of the directors who were on a part time or consultant basis were in the cities where their cytotechnologists worked.

Slightly more than half (52%) of the cytotechnologists said that their laboratory directors and immediate supervisors were available at all times for consultation about laboratory problems. About half (53%) reported that they consulted their immediate supervisors daily about laboratory problems.

## DUTIES AND RESPONSIBILITIES

The types of positions held by the 249 cytotechnologists are almost equally divided between supervisory (29%), non-supervisory (31%) and sole cytotechnologist (22%). Approximately one-third (35%) stated that they were teaching cytotechnology but most were assisting rather than supervising in programs.

Half of the 249 cytotechnologists stated that they made decisions about the purchase of all equipment, reagents, etc. in the laboratory. Complete responsibility for such purchases was indicated by 29% of all of the cytotechnologists. Approximately one-third (35%) indicated that they have this responsibility for some of the equipment, reagents, etc. Somewhat more of those with complete responsibility of this nature failed the 1965 certification examination than passed, but the difference is not statistically significant.

Eighty-two percent (204) of the cytotechnologists reported that their immediate supervisors had defined their duties and responsibilities for them. Almost all (92%) said they felt that they had been given the responsibility to use independent judgment in the performance of their duties. All of the negative replies to both of these questions were given by people who passed the 1965 certification examination.

Approximately three-fourths (72%) of the cytotechnologists reported that they discussed problems pertaining to laboratory tests with physicians and others ordering them.

About three-fourths (73%) of the cytotechnologists said that staff pathologists or physicians in their institutions instructed clinicians in methods of specimen procurement to assure proper sampling and cell distribution on micro slides. Only three of the 249 cytotechnologists stated that they did so when a physician was not available.

## QUALITY CONTROL MEASURES

The following activities in the practice of cytotechnology were identified by the study consultants as quality control measures:

(1) the review of cytotechnologists' morphologic interpretations by laboratory directors;
(2) information used for correlating clinical and cytologic diagnoses;
(3) identification and verification of specimens throughout preparatory and screening processes;
(4) preparation, maintenance and evaluation of staining solutions.

Physicians reviewed all of the micro slides screened by 16% of the cytotechnologists. Only those showing positive and inconclusive morphology were reviewed by physicians for almost two-thirds (61%) of the cytotechnologists. About one-third of the people giving this reply said that physicians also examined other slides including those for all non-genital cases, certain classifications of abnormal morphology, and material for cytogenetic interpretation. Of those for whom only inconclusive morphology was reviewed by physicians more than the norm for the entire group failed the certification examination than passed it. About half (56%) of the cytotechnologists said that conferences were held in their laboratory departments to review slides and/or cases involving exfoliative cytology. In almost all instances these conferences included pathologists and cytotechnologists.

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1/ Hospitals, Journal of the American Hospital Association, Guide Issue Part 2; 41: 453 (August 1) 1967 (Table 1)

The cytotechnologists used several sources of information for correlating clinical and cytologic diagnoses including surgery schedules, medical records, pathology surgical and autopsy reports, and notations from patients' physicians. No particular pattern is evident in these responses.

Table 13 shows the responses of 229 of the cytotechnologists who indicated their present job experiences in identification and verification of specimens, and preparation and use of staining solutions.

Half of the cytotechnologists reported that they record the appearance of specimens on requisition forms when they are received in the laboratory. Included in this group are 33% who said they record all specimens and 17% only non-genital specimens. About one-fourth (27%) reported that someone else in the laboratory does this.

Two-thirds of the 229 cytotechnologists stated that they use serial accession numbers for verifying patients' and case numbers. This was done by someone else in the laboratory for almost all of the remaining group.

More than half (59%) indicated that they labeled equipment used to process non-genital cases by using case or accession numbers. About one-fourth (27%) said that someone else did this in the laboratory.

About two-thirds (69%) of the 229 cytotechnologists routinely verify patients' names and/or accession numbers on micro slides and requisition forms before processing material. About one-fourth (27%) reported that someone else did this.

Almost half (48%) stated that they routinely record the number of slides and filtration units made from a case at the beginning of processing and slightly more than half (55%) said they used this record to verify the number of slides per case. About one-fourth (28%) said that someone else recorded this information and 19% said that someone else verifies it. This information was not recorded by 19% of the cytotechnologists and not verified by 17%.

Somewhat more than half (59%) of the cytotechnologists regularly check the shelf life of reagents and discard those that have expired. Almost one-third (30%) stated that someone else in the laboratory did this. Seventeen percent said that they make stains and reagents used in the laboratory. The remainder either purchase some or all of them, or had someone else in the laboratory do this.

Almost three-fourths (72%) of the 229 cytotechnologists reported that they examined the slides for quality of staining either each time a batch is processed or at least once a day. This was done weekly or when the stain is changed by 15% of the group and by someone else for 10% of the group.

Stains were filtered each time slides were processed or several times a day by 12% of the cytotechnologists and daily or less frequently by 54% of them. One-third had someone else take care of this duty.

Alcohols for the staining procedure were filtered each time slides were stained or several times a day by 5% of the cytotechnologists and daily or less frequently by one-third of them. Someone else did this for almost one-third (29%) of the group. Approximately one-third (30%) did not filter alcohols.

Three percent of the cytotechnologists changed stains daily and almost two-thirds (64%) weekly or less frequently. Almost all of the remainder said that someone else in the laboratory did this for them.

Alcohol solutions were changed daily by 12% of the cytotechnologists and twice a week or less frequently by about half (52%) of them. One-third reported that someone else in the laboratory did this.

Body cavity fluids (hypercellular specimens) were stained separately by approximately one-third (35%) of the cytotechnologists. About one-fourth (29%) said that they did not stain them separately and the same portion said that someone else did this for them.

## TABLE 11

## CHARACTERISTICS OF CYTOTECHNOLOGISTS PERTAINING TO WORKING ENVIRONMENT

| Item | Total in Study | | Passed Exam | Failed Exam |
|---|---|---|---|---|
| | N[a] | %[a] | %[b] | %[b] |
| Number and percent of cytotechnologists.......... | 249 | 100 | 89 | 11 |
| 1. Total working experience | | | | |
| 1 year or less .............................. | 1 | X[u] | 0 | 100 |
| 2 years...................................... | 14 | 6 | 93 | 7 |
| 3 years...................................... | 71 | 29 | 93 | 7 |
| 4 years...................................... | 88 | 35 | 94 | 6 |
| 5 years or more[c] ............................ | 74 | 30 | 81[t] | 19[t] |
| No reply .................................... | 1 | X[u] | 0 | 100 |
| 2. Employed in | | | | |
| Arizona...................................... | 3 | 1 | 67 | 33 |
| California .................................. | 29 | 12 | 90 | 10 |
| District of Columbia ........................ | 3 | 1 | 0 | 100 |
| Illinois .................................... | 11 | 4 | 91 | 9 |
| Kentucky .................................... | 4 | 2 | 75 | 25 |
| Missouri .................................... | 5 | 2 | 80 | 20 |
| Montana...................................... | 1 | X[u] | 0 | 100 |
| New Jersey .................................. | 5 | 2 | 80 | 20 |
| New York .................................... | 19 | 8 | 90 | 10 |
| North Carolina .............................. | 10 | 4 | 80 | 20 |
| Pennsylvania ................................ | 13 | 5 | 69 | 31 |
| Tennessee.................................... | 5 | 2 | 60 | 40 |
| Texas........................................ | 12 | 5 | 92 | 8 |
| Virginia .................................... | 9 | 4 | 78 | 22 |
| Other[d] .................................... | 111 | 45 | 100 | 0 |
| No reply .................................... | 9 | 4 | 78 | 22 |
| 3. Director of Laboratory | | | | |
| a. M.D., Pathologist ....................... | 216 | 87 | 88 | 12 |
| Full Time................................ | 199 | 80 | 88 | 12 |
| Part Time................................ | 11 | 5 | 91 | 9 |
| Consultant .............................. | 6 | 2 | 100 | 0 |
| b. M.D., Not Pathologist.................... | 13 | 5 | 92 | 8 |
| Full Time................................ | 8 | 3 | 100 | 0 |
| Part Time................................ | 5 | 2 | 80 | 20 |
| Consultant .............................. | 0 | 0 | 0 | 0 |
| c. Not M.D.: Full Time ..................... | 4 | 2 | 100 | 0 |
| d. No reply ................................ | 16 | 6 | 94 | 6 |
| e. Location of part time or consultant director | | | | |
| Same city, same state.................... | 15 | 6 | 87 | 13 |
| Different city, same state .............. | 2 | X[u] | 100 | 0 |
| No reply ................................ | 232 | 93 | 89 | 11 |

TABLE 11
(continued)

| Item | Total in Study | | Passed Exam | Failed Exam |
|---|---|---|---|---|
| | N[a] | %[a] | %[b] | %[b] |
| 4. Length of time at place of present employment | | | | |
| 1 year or less | 47 | 19 | 87 | 13 |
| 2 years | 35 | 14 | 89 | 11 |
| 3 years | 66 | 27 | 92 | 8 |
| 4 years | 45 | 18 | 93 | 7 |
| 5 years or more[e] | 35 | 14 | 80 | 20 |
| No reply | 21 | 8 | 90 | 10 |
| 5. Full time employment | 220 | 88 | 89 | 11 |
| a. Schedule | | | | |
| Days only | 184 | 74 | 90 | 10 |
| Days and weekends | 21 | 8 | 81 | 19 |
| Other[f] | 15 | 6 | 87 | 13 |
| b. Type of laboratory | | | | |
| Hospital | 147 | 59 | 88 | 12 |
| Independent | 55 | 22 | 87 | 13 |
| Other[g] | 18 | 7 | 94 | 6 |
| c. Time spent in cytology | | | | |
| 100% | 156 | 63 | 90 | 10 |
| 99% through 60% | 35 | 14 | 80 | 20 |
| 59% through 40% | 9 | 4 | 100 | 0 |
| 39% or less | 7 | 3 | 86 | 14 |
| No reply | 13 | 5 | 85 | 15 |
| d. Time spent in pathology (histology) | | | | |
| 100% | 12 | 5 | 75 | 25 |
| 99% through 60% | 3 | 1 | 100 | 0 |
| 59% through 40% | 6 | 2 | 100 | 0 |
| 39% or less | 19 | 8 | 68 | 32 |
| No reply | 180 | 72 | 91 | 9 |
| e. Time also spent in[h] | | | | |
| Hematology | 23 | 9 | 87 | 13 |
| Chemistry | 14 | 6 | 86 | 14 |
| Microbiology | 9 | 4 | 89 | 11 |
| Blood Bank | 7 | 3 | 86 | 14 |
| Other laboratory departments | 16 | 6 | 88 | 12 |
| 6. Part time employment[i] | 41 | 16 | 90 | 10 |
| a. Schedule | | | | |
| Days only | 18 | 7 | 94 | 6 |
| Days and weekends | 3 | 1 | 100 | 0 |
| Other[i] | 20 | 8 | 85 | 15 |
| b. Type of laboratory | | | | |
| Hospital | 18 | 7 | 89 | 11 |
| Independent | 19 | 8 | 95 | 5 |
| Other[j] | 4 | 1 | 50 | 50 |

## TABLE 11
(continued)

| Item | Total in Study | | Passed Exam | Failed Exam |
|---|---|---|---|---|
| | N[a] | %[a] | %[b] | %[b] |
| 6. Part time employment (continued) | | | | |
| c. Time spent in cytology | | | | |
| 100%.................................. | 25 | 10 | 84 | 16 |
| Less than 100%........................ | 7 | 3 | 86 | 14 |
| No reply.............................. | 9 | 4 | 100 | 0 |
| d. Time spent in pathology (histology) | | | | |
| 100%.................................. | 4 | 2 | 100 | 0 |
| Less than 100%........................ | 0 | 0 | 0 | 0 |
| No reply.............................. | 37 | 14 | 89 | 11 |
| e. Time also spent in[h] | | | | |
| Hematology............................ | 2 | x[u] | 100 | 0 |
| Chemistry ............................ | 2 | x[u] | 100 | 0 |
| Microbiology.......................... | 4 | 2 | 100 | 0 |
| Blood Bank............................ | 2 | x[u] | 100 | 0 |
| Other laboratory departments.......... | 3 | 1 | 100 | 0 |
| 7. Type of position held | | | | |
| a. Supervisory ....................... | 73 | 29 | 89 | 11 |
| Chief Cytotechnologist................ | 65 | 26 | 89 | 11 |
| Section Chief ........................ | 6 | 2 | 83 | 17 |
| Chief of Research .................... | 2 | x[u] | 100 | 0 |
| b. Non-supervisory ................... | 78 | 31 | 91 | 9 |
| Cytopreparation ...................... | 1 | x[u] | 100 | 0 |
| Cytoscreening ........................ | 28 | 11 | 86 | 14 |
| Cytopreparation and cytoscreening ...... | 46 | 18 | 93 | 7 |
| Research.............................. | 1 | x[u] | 100 | 0 |
| Other[k].............................. | 2 | x[u] | 100 | 0 |
| c. Sole cytotechnologist ............. | 68 | 22 | 87 | 13 |
| d. No reply........................... | 30 | 12 | 90 | 10 |
| e. Teaching duties | | | | |
| Yes .................................. | 86 | 35 | 92 | 8 |
| Teaching supervisor.................. | 9 | 4 | 100 | 0 |
| Assist with teaching ................ | 77 | 31 | 91 | 9 |
| No reply.............................. | 163 | 65 | 88 | 12 |
| 8. Time in present position | | | | |
| 1 year or less........................ | 62 | 25 | 89 | 11 |
| 2 years .............................. | 40 | 16 | 90 | 10 |
| 3 years .............................. | 56 | 22 | 95 | 5 |
| 4 years .............................. | 34 | 14 | 94 | 6 |
| 5 years or more[l].................... | 29 | 12 | 79 | 21 |
| No reply.............................. | 28 | 11 | 82 | 18 |

TABLE 11
(continued)

| Item | Total in Study | | Passed Exam | Failed Exam |
|---|---|---|---|---|
| | N[a] | %[a] | %[b] | %[b] |
| 9. Consultation with | | | | |
| a. Laboratory Director | | | | |
| Available at all times | 129 | 52 | 85 | 15 |
| Available often | 67 | 27 | 97 | 3 |
| Available when needed | 38 | 15 | 92 | 8 |
| Other[m] | 5 | 2 | 80 | 20 |
| No reply | 10 | 4 | 80 | 20 |
| b. Immediate supervisor | | | | |
| Available at all times | 129 | 52 | 88 | 12 |
| Available often | 22 | 9 | 96 | 4 |
| Available when needed | 19 | 8 | 84 | 16 |
| Other[m] | 3 | 1 | 67 | 33 |
| No reply | 76 | 31 | 91 | 9 |
| c. Frequency of consulting immediate supervisor | | | | |
| Daily | 132 | 53 | 90 | 10 |
| Weekly | 29 | 12 | 93 | 7 |
| Less than weekly | 21 | 8 | 86 | 14 |
| When necessary | 21 | 8 | 81 | 19 |
| Other[n] | 8 | 3 | 100 | 0 |
| No reply | 38 | 15 | 87 | 13 |
| 10. Make decisions about purchase of | | | | |
| a. all equipment, etc. | | | | |
| Yes, help others | 54 | 22 | 91 | 9 |
| Yes, have complete responsibility | 73 | 29 | 85 | 15 |
| No, do not do this | 60 | 24 | 92 | 8 |
| No reply | 62 | 25 | 90 | 10 |
| b. some equipment, etc. | | | | |
| Yes, help others | 56 | 23 | 95 | 5 |
| Yes, have complete responsibility | 30 | 12 | 87 | 13 |
| No, do not do this | 40 | 16 | 88 | 12 |
| No reply | 123 | 49 | 88 | 12 |
| 11. Duties and responsibilities defined by supervisor | | | | |
| Yes | 204 | 82 | 88 | 12 |
| No | 27 | 11 | 100 | 0 |
| No reply | 18 | 7 | 89 | 11 |
| 12. Given responsibility to use independent judgment in performance of duties | | | | |
| Yes | 230 | 92 | 89 | 11 |
| No | 10 | 4 | 100 | 0 |
| No reply | 9 | 4 | 78 | 22 |
| 13. Discuss problems with laboratory tests with those who request them | | | | |
| Yes | 180 | 72 | 90 | 10 |
| No | 56 | 23 | 89 | 11 |
| No reply | 13 | 5 | 77 | 23 |

TABLE 11
(continued)

| Item | Total in Study | | Passed Exam | Failed Exam |
|---|---|---|---|---|
| | N[a] | %[a] | %[b] | %[b] |
| 14. Review of screened slides by physician | | | | |
| All slides reviewed | 41 | 16 | 93 | 7 |
| Positive slides only | 1 | X[u] | 100 | 0 |
| Inconclusive slides only | 9 | 4 | 78 | 22 |
| Positive and inconclusive slides | 151 | 61 | 87 | 13 |
| Positive, inconclusive and sample of negative | 29 | 12 | 97 | 3 |
| Other[o] | 7 | 3 | 100 | 0 |
| None of slides reviewed | 1 | X[u] | 100 | 0 |
| No reply | 10 | 4 | 80 | 20 |
| 15. Slide &/or case reviews by department staff | | | | |
| a. Schedule | | | | |
| Daily | 64 | 26 | 89 | 11 |
| Weekly | 26 | 10 | 92 | 8 |
| Other[p] | 50 | 20 | 86 | 14 |
| No reviews | 89 | 36 | 91 | 9 |
| No reply | 20 | 8 | 85 | 15 |
| b. Participants | | | | |
| All staff including pathologist & cytotechnologists | 74 | 30 | 89 | 11 |
| Laboratory Director, Chief & cytotechnologists | 32 | 13 | 91 | 9 |
| Chief & cytotechnologists only | 19 | 8 | 84 | 16 |
| Pathologists &/or other physicians only | 8 | 3 | 88 | 12 |
| Other[q] | 5 | 2 | 80 | 20 |
| No reply | 111 | 45 | 90 | 10 |
| 16. Sources of information for correlating clinical and cytologic diagnoses | | | | |
| Surgery schedule | 1 | X[u] | 0 | 100 |
| Medical records | 13 | 5 | 69 | 31 |
| Pathology surgical report | 46 | 19 | 89 | 11 |
| Pathology autopsy report | 2 | X[u] | 100 | 0 |
| Combination of above sources | 122 | 49 | 90 | 10 |
| All sources | 31 | 12 | 97 | 3 |
| Other[r] | 15 | 6 | 93 | 7 |
| None | 3 | 1 | 67 | 33 |
| No reply | 16 | 6 | 88 | 12 |
| 17. Specimen procurement instruction given by | | | | |
| Staff pathologist or physician | 183 | 73 | 87 | 13 |
| Staff members other than pathologist or physician | 29 | 12 | 100 | 0 |
| Cytotechnologist when physician not present | 3 | 1 | 100 | 0 |
| Other[s] | 8 | 3 | 88 | 12 |
| No instruction given | 9 | 4 | 89 | 11 |
| No reply | 17 | 7 | 88 | 12 |

## Footnotes for Table 11

a. The summations of N (number) and % (percent) for the Total group follow the vertical dimension of the table. All percents are based on 249 people.

b. The summations of % (percent) for Passed Exam and Failed Exam groups follow the horizontal dimension of the table. All percents are based on the N (number) in the corresponding parallel column. For example: 14 people had two years of college of whom 93% passed the 1965 certification examination and 7% failed. The examination is that given by the Board of Registry of Medical Technologists (ASCP) in 1965 for certification of cytotechnologists.

c. The maximum number of years of total working experience for the Total and Passed Exam groups is 15, for the Failed Exam group is 13.

d. "Other" includes 29 states, Canada and Puerto Rico in the Total and Passed Exam groups of which each have less than 5% of the people in the Total group, all of whom passed the 1965 certification examination.

e. The maximum number of years worked at the present place of employment for the Total and Passed Exam groups is 14, and for the Failed Exam group is 10.

f. "Other" includes 4 people who work day and night schedules,
6 people who work day, weekend and night schedules,
4 people who work at home, and
1 person who works at night only.

g. "Other" includes 8 people who work in public health laboratories,
1 person who works in a research laboratory,
2 people who work independently at home, and
7 people who combine work in hospital laboratories with research and independent laboratories.

h. These percents should not total 100% for the Total group. Each section should be considered separately, i.e. the portion of cytotechnologists working in laboratory departments other than cytology and histology.

i. "Other" includes 1 person who works day and night schedules,
2 people who work day, weekend and night schedules,
5 people who work nights only,
6 people who work night and weekend schedules,
1 person who works only a weekend schedule, and
5 people who work occasionally as relief staff.
Twelve people indicated both full and part time employment. Of these, ten passed the 1965 certification examination and 2 failed it.

j. "Other" includes 2 people who work in research laboratories,
1 person who works at home, and
1 person who combines hospital and independent laboratories.

k. "Other" includes 1 person screening at home, and
1 person combining cytoscreening with general emergency call in laboratory.

l. The maximum number of years worked in the present position for the Total and Passed Exam groups is 13, for the Failed Exam group is 9.

m. "Other" includes replies of "Available by phone or mail only" and "Not always available when needed.".

n. "Other" includes 8 replies which do not indicate clearly that there is consultation with the immediate supervisor, of which two are from people who work alone.

## Footnotes for Table 11
(continued)

o. "Other" includes replies specifying the cell classification submitted for review, most being "Class II" and above.

p. "Other" includes review times varying from "every other day" to "isolated occasions" to specification of cases reviewed to "cases of interest".

q. "Other" includes replies to the effect that "it depends on the situation", "students", "discussion of research together".

r. "Other" includes references to use of information on requisition forms, information from doctors, tumor registry.

s. "Other" includes replies to the effect that cytotechnologist does this when necessary (in absence of physician). One person did not know who was responsible for this instruction.

t. Calculation of the chi square test for distribution shows that these figures are statistically significant in that the frequency of replies exceeds the 0.05 probability level.
$X^2 = 9.08$; df = 3, $X^2 = 7.81$

**u.** X = Less than 1 .

# Education Background

The education background reported by the cytotechnologists includes the length of time they attended college, certain aspects of their cytotechnology training, and their involvement in continuing education. Table 12 summarizes this information.

## COLLEGE

Almost all (95%) of the 249 cytotechnologists reported that they attended college for two years or longer. About one-third (35%) attended for four years, almost all of whom earned Bachelor's degrees. Approximately half (47%) of them were in college for two or three years, but the major portion did not obtain degrees. Significantly more of those attending for four years or longer earned Bachelor's or higher degrees, whereas fewer of those who attended for two or three years earned degrees. Significantly more of those who attended college for one year or less failed the 1965 certification examination.

## CLINICAL STUDY PROGRAMS

The cytotechnologists' clinical study [1] programs varied in length because some received their instruction prior to the time the A.M.A. Council on Medical Education accredited schools of cytotechnology. For purposes of this study, the time cytotechnologists spent in their clinical study programs is classified as "12 months" and "Other". The latter refers to those programs which the study participants said varied in length from three months through 12 years. The replies are further divided into accredited and non-accredited programs according to the A.M.A. Council on Medical Education.

Eighty-three percent (206) of the 249 cytotechnologists indicated that their clinical study programs were 12 months in length. About half of these were divided so that the first six months, consisting primarily of didactic work, was spent in one laboratory and the second six months (primarily practical work) elsewhere. The other half of this group stayed in one laboratory for the entire period. Significantly more of the cytotechnologists in the latter group had their 12 months of clinical study in a laboratory that was not accredited as a school of cytotechnology than did those who divided their 12 months of study. There is no significant difference , however, in the certification examination performance of the people in accredited and non-accredited programs in the two groups.[2]

A comparison of the people attending accredited and non-accredited programs, regardless of their length, shows that significantly more of those who attended accredited programs passed the 1965 certification examination and more of those who attended non-accredited programs failed it. Eighty-four percent of the cytotechnologists reported that they attended accredited programs.

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[1] The term "clinical study" is defined as the period of training in cytotechnology in a medical laboratory which is a prerequisite for applying for the ASCP certification examination. This training was obtained in schools of cytotechnology accredited by the Council on Medical Education of the American Medical Association by 209 of the 249 people who returned questionnaires. The remaining 40 people were trained prior to 1960 under the direction of pathologists or other physicians recognized in the field of cytology.

[2] $X^2 = 2.78$; df = 1, $X^2 = 3.84$ (0.05 probability level)

The clinical study programs were located in 33 states, the District of Columbia and Puerto Rico with the largest number of people attending in California (10%), New York (10%), and Pennsylvania (8%). A larger than normal percent of people who attended programs in the District of Columbia, Pennsylvania and Tennessee failed the 1965 examination.[1] Seventy percent of the cytotechnologists indicated that they completed their clinical study (second six months period) in 35 states, Canada and a foreign country. The states in which the largest number of people completed this portion of their programs are California (9%) and New York (7%).

As noted earlier in this report, two-thirds of the 249 cytotechnologists were working in the state in which they received their training. This group includes 19% who said they worked in the laboratory in which they did their clinical study, 23% worked in the same city but a different laboratory, and 24% worked in the same state but a different city.

The cytotechnologists were asked to indicate the number of lectures in basic sciences, cytology and cytopreparatory techniques they received during their clinical study program. About half (48%) said they attended lectures in the basic sciences with most receiving more than ten. Cytology lectures were attended by three-fourths of the cytotechnologists of whom most indicated more than 30. Two-thirds of them attended lectures in cytopreparatory techniques. The number of lectures in this subject seems to vary more than the other two because almost as many people attended 31 or more lectures as 11 through 30 and one through ten lectures.

Replies about the presentation of lectures pertaining to cytotechnology during the second half of the 12 month program were given by three-fourths of the cytotechnologists. This includes 43% who said lectures were given and 32% who said they were not.

Almost all (91%) of the cytotechnologists said they had quizzes and/or examinations during their clinical study with the majority (55%) having approximately one per week.

Two through four hours per day were spent in microscopic study by about half (55%) of the cytotechnologists during the first half of their clinical program. This was done for a longer period each day, five or six hours, by about one-third (35%) during the first half of the program. Most (84%) of the cytotechnologists spent five or more hours per day in microscopic study during the second half of their clinical study.

## CLINICAL STUDY PROGRAMS: QUALITY CONTROL MEASURES

### Education Experiences

Table 13 presents the responses of 215 cytotechnologists who indicated their education experiences in schools of cytotechnology with the quality control measures pertaining to identification and verification of specimens, and staining procedures. The following paragraphs summarize the finding for these school experiences.

About half (46%) of the cytotechnologists said they recorded the appearance of all specimens on requisition forms as soon as they were received in the laboratory. About one-fourth (29%) said they recorded the appearance of non-genital specimens only.

Almost all (91%) reported that they used serial accession numbers for verifying patients' and case numbers. Eighty-one percent stated that they recorded the case number on equipment used to process non-genital cases. Slightly more (83%) said they routinely checked patients' names and/or accession numbers on micro slides with those on requisition forms.

More than two-thirds (69%) indicated that they routinely recorded the number of micro slides and filtration units made from a specimen when processing is started and, further, used this number to verify the number of slides per case.

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[1] The chi square test for distribution could not be applied in all instances because the N in several of the fail groups is less than 5. The distribution of 89% of the group passing and 11% failing the 1965 certification examination constitutes the norm (normal) for this population.

About half (54%) of the cytotechnologists said they regularly checked the shelf life of reagents for staining specimens and discarded those that have expired. Almost one-third (30%) said that someone else in the laboratory did this. The stains and reagents used in the laboratory were prepared by 40% of the cytotechnologists.

Two-thirds of the cytotechnologists said they examined micro slides for staining quality each time a batch was stained or at least daily.

One-fourth of them said they filtered stains after each batch of slides was processed or at least several times a day and almost two-thirds (63%) said they did so daily or less frequently. Alcohols were filtered each time slides were stained or several times a day by 14% of the cytotechnologists and almost half (46%) said they did so daily or less frequently. One-fourth reported that they did not do this.

Twelve percent of the cytotechnologists said they changed stains in staining dishes each day. Almost three-fourths said they did this weekly or less frequently. About one-fourth (27%) of the group changed alcohol solutions used for staining each day and 59% said they did so twice a week or less frequently.

Body cavity (hypercellular) fluids were stained separately by two-thirds of the cytotechnologists.

There is no outstanding deviation from the norm in the performance related to these school experiences in the comparison of those who passed with those who failed the 1965 certification examination.

## Education Applied to Job Experiences

The extent to which the cytotechnologists were prepared in the education programs (schools of cytotechnology) for using quality control measures in their present jobs is shown in Table 14. This depicts the transfer of learning experiences. From about half (56%) to two-thirds (68%) of the 215 cytotechnologists identified and verified specimens on their jobs in the same way they did in the clinical study programs.

In most instances the remaining replies show that cytotechnologists did not deviate from the type of performance learned in the education program but indicated that someone else in the laboratory was responsible for fulfilling the duty. This is also true of the preparation and purchase of reagents. Eighty percent of the cytotechnologists who learned to examine micro slides for staining quality after each batch is stained or daily are doing the same thing on their present jobs. About half (46%) to two-thirds of the cytotechnologists who learned that stains and alcohol solutions should be changed each time slides are stained or several times daily are doing this less frequently on their jobs.

Less than half (43%) of the cytotechnologists who stained body cavity (hypercellular) fluids separately when in the school of cytotechnology are doing so in their jobs. It is noted, however, that about one-fourth (27%) of those who learned to stain them separately said that someone else in the laboratory did this.

Table 15 shows the reverse situation: the extent to which cytotechnologists' job experiences are the same as their education experiences. More than three-fourths (73% - 84%) of the cytotechnologists identified and verified specimens on their jobs as they were instructed in the school of cytotechnology. The major portion of those who have someone else doing this on the job actually did it in the education program. This same pattern prevails in the performance of procedures for staining specimens. It is noteworthy that three-fourths of those who are staining body cavity (hypercellular) fluids separately on their jobs did so in the education program.

## Apprentice Experience

The replies of 109 cytotechnologists who indicated their quality control experiences in laboratories that were not schools of cytotechnology ("Apprentice") were distributed approximately the same as those given above for school experiences with the exception of staining hypercellular fluids. Fewer (46% versus 66%) of these cytotechnologists stained body cavity (hypercellular) fluids separately. (Table 13)

### Apprentice Applied to Job Experiences

The transfer of apprentice experiences to job experiences are similar to those given above for school of cytotechnology and job experiences with the exception of filtering and changing stains and alcohol solutions. These types of procedures were done on the job in a different way than in the apprentice laboratory. (Tables 16 and 17)

## CLINICAL STUDY PROGRAMS: TECHNICAL PROCEDURES

Table 18 presents the cytotechnologists' education, apprentice, and job experiences related to the technical procedures in obtaining specimens, cytopreparation, staining, and microscopic morphology.

### Education Experiences

The following paragraphs summarize the responses of 218 cytotechnologists who indicated the technical procedures they performed in the school of cytotechnology (education experiences).

Less than one-fourth of the 218 cytotechnologists reported that they obtained female genital specimens during their education program. About half (52%) or less obtained non-genital specimens of which gastric and oral samples were done most commonly.

In cytopreparatory techniques, almost all (90%) of the cytotechnologists used centrifuging and three-fourths used cell filtration units. Irrigation technique was performed by the least number of people, about one-third (35%).

Essentially all (98%) of the 218 cytotechnologists said they used the Papanicolaou method of staining (or a modification) in their education program. About one-third (32% and 29%) indicated that they used hormonal and cytogenetic staining methods.

Microscopic cytomorphology was done on the following material by 85% or more of the 218 cytotechnologists indicating education experiences:

Female genital including cervical, vaginal, endocervical, and endometrial;
Sputum and bronchial washings;
Esophageal and gastric;
Pleural and ascitic fluids;
Urine;
Breast;
Oral;
Hormonal; and
Radiation or chemotherapy.

About three-fourths (74% and 78%) of them observed the cytomorphology of material from the colon and pericardial fluid. Microscopic evaluations were done by less than half of them on female genital irrigation specimens (49%), viral material (43%) and cytogenetics (37%). About one-fourth (28%) performed the acridine orange fluorescence technique. Eight percent used the electron microscope.

The comparison of people who passed with those who failed the 1965 certification examination follows the norm for the entire group in all techniques except those for obtaining female genital specimens. More of those who indicated having done this failed the certification examination.

### Apprentice Experiences

The replies of 113 cytotechnologists who noted the technical procedures they performed in the clinical study programs in laboratories that were not accredited schools of cytotechnology are given in Table 18 and summarized in the following paragraphs.

Twelve percent or less of the 113 cytotechnologists reporting apprentice experiences obtained female genital specimens. Gastric wash and oral specimens were obtained by about one-third (35% and 39%).

Centrifuging is the only cytopreparatory technique done by most (88%) of the 113 cytotechnologists. Half of them used cell filtration units and 9% irrigation techniques.

Almost all (94%) used the Papanicolaou method of staining (or modification) one-third performed cytogenetic staining methods and about one-fourth (27%) the hormonal methods.

Microscopic cytomorphology was done on the following material by 83% or more of the 113 cytotechnologists indicating their apprentice experiences:

Female genital including cervical, vaginal, endocervical, and endometrial;
Sputum and bronchial washings;
Gastric;
Pleural and ascitic fluids;
Urine;
Breast;
Oral; and
Hormonal.

About three-fourths (73% and 77%) of them observed the cytomorphology of material from the colon and radiation or chemotherapy. Microscopic evaluations were done by about half of them on female genital irrigation specimens (42%), colon material (56%) and pericardial fluid (58%). Other microscopic evaluations performed were on viral materials (39%) and cytogenetics (31%). Ten percent of these cytotechnologists performed the acridine orange fluorescence technique and 3% used the electron miscroscope.

The comparison of people who passed with those who failed the 1965 certification examination follows the norm for the entire group in all techniques except those for obtaining female genital specimens. More of those who indicated having done the latter failed the examination.

## Education and/or Apprentice Experiences Applied to Job Experiences

The coincidence of clinical study and job performance of techniques is also shown in Table 18. These responses were given by 221 people who indicated the techniques they performed in either the school of cytotechnology or apprentice laboratories or both as well as on their present jobs. Less than 10% of the 221 cytotechnologists stated that they obtained female genital specimens in both clinical study and on the job. About one-fourth (27% and 25%) obtained gastric wash and oral specimens.

The cytopreparatory technique of centrifuging was done by 72%, cell filtration by 38% and irrigation by 8% of the cytotechnologists in both situations.

Hormonal and cytogenetic staining methods were used by relatively few of the cytotechnologists in clinical study and on the job (19%) in comparison with the use of the Papanicolaou method (or modification) (81%).

Microscopic cytomorphology was done on the following material by 81% or more of the 221 cytotechnologists in their education and job experiences:

Female genital including cervical, vaginal, endocervical and endometrial;
Sputum and bronchial washings;
Pleural and ascitic fluids;
Urine;
Breast; and
Hormonal.

About three-fourths of them observed the cytomorphology of gastric (76%), oral (72%) and radiation or chemotherapy (78%) material. Sixty percent of them did cytomorphology on pericardial fluid, 50% on colon material, 41% on viral material and 25% on cytogenetics. Almost none of them used the electron microscope and acridine orange fluorescence techniques both in clinical study and on the job.

The comparison of people who passed with those who failed the 1965 certification examination follows the norm for the entire group in all techniques except those for obtaining female genital specimens. More of those who indicated having done the latter in both situations failed the examination.

## ATTITUDE ABOUT EDUCATIONAL PREPARATION

Essentially all (96%) of the cytotechnologists said they think their education prepared them to perform the duties assigned to them in their work. (Table 12) Comments about the needs for additional education were made by 27 of the cytotechnologists of whom 21 said they were adequately prepared for their jobs and 6 said they were not.

The need for better preparation in specific science courses was mentioned by one-third of the people commenting. A course in endocrinology was specified by five people, histology by two people and chemistry by one person. The need for courses in supervision and management was stated by one person.

Increased emphasis on instruction in processing and screening non-genital specimens was desired by three people. The inclusion of more instruction in cytoscreening in the second six months of the clinical study program was mentioned by three people.

Non-specific comments made by the remainder of the group refer to the desirability of continuing and refresher education, and regular use of textbooks as well as the general comment that "additional education is always necessary". Two people said they are doing work that is not pertinent to cytotechnology.

Two people who said their education was not adequate commented as follows: "We had to do entirely too much routine staining and filing from which we learned nothing."; "...in training were given little help from supervisory staff.".

## CONTINUING EDUCATION

Attendance at continuing education programs was indicated by three-fourths of the 249 cytotechnologists. (Table 12) Thirty percent earned academic credit hours for courses of which most were toward a Bachelor's degree. About half (53%) participated in workshops or seminars of which the regionally sponsored sessions were most popular. Professional organization meetings were attended by about half (53%) of the cytotechnologists. The American Society of Cytology meetings were attended by the largest number of people.

# TABLE 12

## CHARACTERISTICS OF CYTOTECHNOLOGISTS PERTAINING TO EDUCATION BACKGROUND

| Item | Total in Study | | Passed Exam | Failed Exam |
|---|---|---|---|---|
| | N[a] | %[a] | %[b] | %[b] |
| Number and percent of Cytotechnologists.......... | 249 | 100 | 89 | 11 |
| 1. College Education | | | | |
| 0 years.................................... | 3 | 1 | 100 | 0 |
| 1 year or less ............................ | 9 | 4 | 44[q] | 56[q] |
| 2 years.................................... | 68 | 27 | 90 | 10 |
| No degree.............................. | 44[q] | 17 | 93 | 7 |
| Degree[c]................................ | 24[q] | 10 | 83 | 17 |
| 3 years.................................... | 49 | 20 | 92 | 8 |
| No degree.............................. | 37[q] | 15 | 95 | 5 |
| Degree[c]................................ | 12[q] | 5 | 83 | 17 |
| 4 years.................................... | 87 | 35 | 91 | 9 |
| No degree.............................. | 6[q] | 2 | 100 | 0 |
| Degree[c]................................ | 81[q] | 33 | 90 | 10 |
| 5 or more years[d] ......................... | 28 | 11 | 89 | 11 |
| No degree.............................. | 1[q] | X[p] | 100 | 0 |
| Degree[c]................................ | 27[q] | 11 | 89 | 11 |
| Other[e] ................................ | 5 | 2 | 100 | 0 |
| 2. Time spent in training | | | | |
| a. 12 months................................ | 206 | 83 | 89 | 11 |
| 1) Divided: 6 mo. in each of two institutions ........................ | 109 | 44 | 94 | 6 |
| 1st 6 mo. in accredited program...... | 105[r] | 42 | 93[s] | 7 |
| 1st 6 mo. in non-accredited program.. | 4 | 2 | 100 | 0 |
| 2) Not divided: 12 mo. in 1 institution | 97 | 39 | 84 | 16 |
| Accredited program .................. | 70 | 28 | 86[s] | 14 |
| Non-accredited program .............. | 27[r] | 11 | 78 | 22[s] |
| b. Other[f] .................................. | 43 | 17 | 93 | 7 |
| Accredited program ....................... | 34 | 14 | 97[s] | 3 |
| Non-accredited program ................... | 9 | 3 | 78 | 22[s] |
| 3. Location of clinical study | | | | |
| California................................. | 26 | 10 | 92 | 8 |
| District of Columbia...................... | 5 | 2 | 40 | 60 |
| Illinois................................... | 15 | 6 | 100 | 0 |
| Maryland................................... | 10 | 4 | 90 | 10 |
| Michigan................................... | 5 | 2 | 80 | 20 |
| Missouri................................... | 4 | 2 | 75 | 25 |
| New York................................... | 25 | 10 | 92 | 8 |
| North Carolina............................. | 16 | 6 | 81 | 19 |
| Ohio....................................... | 12 | 5 | 83 | 17 |
| Oklahoma................................... | 6 | 2 | 83 | 17 |
| Pennsylvania............................... | 19 | 8 | 79 | 21 |
| Tennessee ................................. | 11 | 4 | 73 | 27 |
| Texas ..................................... | 14 | 6 | 93 | 7 |
| Virginia................................... | 11 | 4 | 91 | 9 |
| Wisconsin ................................. | 7 | 3 | 86 | 14 |
| Puerto Rico ............................... | 6 | 2 | 83 | 17 |
| Other[g].................................... | 57 | 23 | 100 | 0 |

## TABLE 12
(continued)

| Item | Total in Study | | Passed Exam | Failed Exam |
|---|---|---|---|---|
| | N[a] | %[a] | %[b] | %[b] |
| 4. Location of second 6 months study | | | | |
| Arizona | 4 | 2 | 75 | 25 |
| California | 23 | 9 | 87 | 13 |
| Illinois | 11 | 4 | 91 | 9 |
| Kentucky | 3 | 1 | 67 | 33 |
| New York | 17 | 7 | 94 | 6 |
| North Carolina | 4 | 2 | 75 | 25 |
| Ohio | 10 | 4 | 90 | 10 |
| Pennsylvania | 12 | 5 | 83 | 17 |
| Tennessee | 5 | 2 | 60 | 40 |
| Virginia | 6 | 2 | 83 | 17 |
| Wisconsin | 3 | 1 | 67 | 33 |
| Other[h] | 76 | 31 | 100 | 0 |
| No reply | 75 | 30 | 84 | 16 |
| 5. Working where school or on the job training attended | | | | |
| Yes, same laboratory | 46 | 19 | 91 | 9 |
| Yes, same city, different laboratory | 56 | 23 | 86 | 14 |
| Yes, same state, different city | 59 | 24 | 93 | 7 |
| No, out of state | 76 | 30 | 91 | 9 |
| No reply | 12 | 5 | 67 | 33 |
| 6. Lectures given during training program | | | | |
| a. Given at second training center | | | | |
| Yes | 108 | 43 | 89 | 11 |
| No | 80 | 32 | 93 | 7 |
| Other[i] | 1 | x[p] | 100 | 0 |
| No reply | 60 | 24 | 85 | 15 |
| b. Given as part of training program | | | | |
| 1) Basic Sciences | | | | |
| 1 through 10 lectures | 31 | 12 | 90 | 10 |
| 11 through 30 lectures | 46 | 18 | 91 | 9 |
| 31 lectures or more[j] | 44 | 18 | 82 | 18 |
| No reply | 128 | 51 | 91 | 9 |
| 2) Cytology | | | | |
| 1 through 30 lectures | 46 | 18 | 83 | 17 |
| 31 through 100 lectures | 88 | 35 | 91 | 8 |
| 101 lectures or more[j] | 51 | 21 | 88 | 12 |
| No reply | 64 | 26 | 92 | 8 |
| 3) Cytopreparatory techniques | | | | |
| 1 through 10 lectures | 61 | 25 | 89 | 11 |
| 11 through 30 lectures | 48 | 19 | 92 | 8 |
| 31 lectures or more[j] | 52 | 21 | 85 | 15 |
| No reply | 88 | 35 | 91 | 9 |

TABLE 12
(continued)

| Item | Total in Study | | Passed Exam | Failed Exam |
|---|---|---|---|---|
| | N[a] | %[a] | %[b] | %[b] |
| 7. Quizzes &/or examinations given during training program | | | | |
| Approximately one per day | 20 | 8 | 90 | 10 |
| Approximately one per week | 137 | 55 | 91 | 9 |
| Approximately one per month | 45 | 18 | 82 | 18 |
| Less than one per month | 25 | 10 | 92 | 8 |
| Other[k] | 3 | 1 | 67 | 33 |
| No reply | 19 | 8 | 95 | 5 |
| 8. Hours per day spent screening slides during | | | | |
| a. First half of training program | | | | |
| 2 through 4 hours | 136 | 55 | 86 | 14 |
| 5 through 6 hours | 88 | 35 | 93 | 7 |
| 7 through 8 hours | 11 | 4 | 91 | 9 |
| Other[l] | 3 | 1 | 100 | 0 |
| No reply | 11 | 4 | 91 | 9 |
| b. Second half of training program | | | | |
| 2 through 4 hours | 27 | 11 | 93 | 7 |
| 5 through 6 hours | 107 | 43 | 92 | 8 |
| 7 through 8 hours | 101 | 41 | 87 | 13 |
| No reply | 14 | 6 | 79 | 21 |
| 9. Continuing education | | | | |
| a. Academic credit | | | | |
| 1) Type | | | | |
| Bachelor's degree | 52 | 21 | 85 | 15 |
| Master's or doctorate[m] | 14 | 6 | 79 | 21 |
| Other[m] | 8 | 3 | 88 | 12 |
| None | 10 | 4 | 90 | 10 |
| No reply | 165 | 66 | 92 | 8 |
| 2) Number of programs attended | | | | |
| None | 2 | x[p] | 100 | 0 |
| 1 program | 70 | 28 | 86 | 15 |
| No reply | 177 | 71 | 90 | 10 |
| b. Non-credit earning (workshops/seminars) | | | | |
| 1) Type | | | | |
| A.S.C.P. Commission on Continuing Edu. | 5 | 2 | 100 | 0 |
| American Society of Cytology | 25 | 10 | 88 | 12 |
| Regionally sponsored programs | 46 | 19 | 93 | 7 |
| Combination of 2 of above 3 | 36 | 14 | 94 | 6 |
| All 3 | 8 | 3 | 75 | 25 |
| Other[n] | 13 | 5 | 85 | 15 |
| None | 12 | 5 | 100 | 0 |
| No reply | 104 | 42 | 86 | 14 |

## TABLE 12
(continued)

| Item | Total in Study | | Passed Exam | Failed Exam |
|---|---|---|---|---|
| | N[a] | %[a] | %[b] | %[b] |
| 9. Continuing education (continued) | | | | |
| b. 2) Number of programs attended | | | | |
| 0 programs | 3 | 1 | 100 | 0 |
| 1 program | 79 | 32 | 90 | 10 |
| 2 programs | 32 | 13 | 94 | 6 |
| 3 programs | 18 | 7 | 89 | 11 |
| 4 programs | 3 | 1 | 100 | 0 |
| 5 programs | 1 | x[p] | 100 | 0 |
| No reply | 113 | 45 | 87 | 13 |
| c. Organizational meetings | | | | |
| 1) Type | | | | |
| American Society of Clinical Pathologists | 4 | 2 | 50 | 50 |
| American Society of Cytology | 45 | 18 | 96 | 4 |
| American Society of Medical Technologists | 13 | 5 | 92 | 8 |
| Combination of 2 of above 3 | 16 | 6 | 88 | 12 |
| All 3 | 3 | 1 | 67 | 33 |
| Other[o] | 53 | 21 | 91 | 9 |
| None | 14 | 6 | 100 | 0 |
| No reply | 101 | 41 | 86 | 14 |
| 2) Number of programs attended | | | | |
| 0 programs | 3 | 1 | 100 | 0 |
| 1 program | 89 | 36 | 91 | 9 |
| 2 programs | 32 | 13 | 88 | 12 |
| 3 programs | 13 | 5 | 92 | 8 |
| 4 programs | 1 | x[p] | 100 | 0 |
| 5 programs | 1 | x[p] | 100 | 0 |
| No reply | 110 | 44 | 87 | 13 |
| 10. Attitude about education | | | | |
| a. Preparation adequate | | | | |
| Yes | 238 | 96 | 89 | 11 |
| No | 6 | 2 | 100 | 0 |
| No reply | 5 | 2 | 80 | 20 |
| b. Comments about needs | | | | |
| Stated needs | 27 | 11 | 96 | 4 |
| No comment | 217 | 87 | 88 | 12 |
| No reply | 5 | 2 | 80 | 20 |

a. The summations of N (number) and % (percent) for the Total group follow the vertical dimension of the table. All percents are based on 249 people.

b. The summations of % (percent) for Passed Exam and Failed Exam groups follow the horizontal dimension of the table. All percents are based on the N (number) in the corresponding parallel column. For example: In the Total group 9 people had 1 year or less of college education of whom 44% passed the 1965 certification examination and 56% failed. The examination is that given by the Board of Registry of Medical Technologists (ASCP) in 1965 for certification of cytotechnologists.

2

## Footnotes for Table 12
(continued)

c. The following summarizes the degrees earned:

| | | |
|---|---|---|
| 2 years of college: | | |
| Associate (24 or 10%) | 20 (83%) Passed Exam | 4 (17%) Failed Exam |
| 3 years of college: | | |
| Associate ( 9 or 4%) | 7 (78%) Passed Exam | 2 (22%) Failed Exam |
| Bachelor's( 3 or 1%) | 3 (100%) Passed Exam | 0 ( 0%) Failed Exam |
| 4 years of college: | | |
| Associate ( 1 or less than 1%) | 1 (100%) Passed Exam | 0 ( 0%) Failed Exam |
| Bachelor's(80 or 32%) | 72 (90%) Passed Exam | 8 (10%) Failed Exam |
| 5 years of college: | | |
| Bachelor's(19 or 8%) | 16 (84%) Passed Exam | 3 (16%) Failed Exam |
| Master's ( 5 or 2%) | 5 (100%) Passed Exam | 0 ( 0%) Failed Exam |
| Doctorate ( 3 or 1%) | 3 (100%) Passed Exam | 0 ( 0%) Failed Exam |

d. The maximum number of years of college education for the Total and Passed Exam groups is 8, for the Failed Exam group is 6.

e. "Other" includes 4 people who have from two through four years of college education but did not give the degree they earned: and 1 person with 4 years of college education who gave the degree of "PHG" which could not be interpreted.

f. "Other" includes 43 people who indicated length of training varying from 3 months through 12 years, "No formal time", and "more than 6 months".

g. "Other" includes 19 states of which each have less than 5% of the people, all of whom passed the 1965 certification examination.

h. "Other" includes 24 states, Canada and another foreign country of which each have less than 5% of the people, all of whom passed the 1965 certification examination.

i. "Other" includes a variety of replies which indicate that the people had conferences and discussions with pathologists but not formal lectures.

j. Maximum number of lectures in basic sciences for the Total and Passed Exam groups is 336, for the Failed Exam group is 130.
Maximum number of lectures in cytology for the Total and Passed Exam groups is 336, for the Failed Exam groups is 192.
Maximum number of lectures in cytopreparation for the Total and Passed Exam groups is 260, for the Failed Exam group is 176.

k. "Other" includes "Can't recall", "varied since training was done in 3 places", and "personal conference daily".
Additional information about types of practical, mid-term, and final examinations was attached to 14 replies.

l. "Other" includes "4 hours on lab duty, 6 hours on study sets", "only the last month 7 hours per day", and "6 hours per day 1st 4 months, 8 hours per day last 2 months".

m. The 14 people include 12 with Master's and 2 with Doctorates.
"Other" includes those who have taken additional college credits but not specifically for a degree.

n. "Other" includes a variety of sessions that were locally sponsored as well as 2 that were in foreign conferences and 1 that noted "visiting lecturers".

o. "Other" includes a variety of international, regional, state and local organizations.

p. X = Less than 1%.

## Footnotes for Table 12
(continued)

q. Calculation of chi square test for distribution shows that the frequency of these replies exceeds the 0.05 probability level.
College education: $X^2 = 12.60$; df = 4, $X^2 = 9.49$

r. Calculation of chi square test for distribution shows that the frequency of these replies exceeds the 0.05 probability level.
Comparison of Accredited/Non-accredited and divided/non-divided/other
$X^2 = 23.14$; df = 2, $X^2 = 5.99$

s. Calculation of chi square test for distribution shows that the frequency of these replies exceeds the 0.05 probability level.
Comparison of Pass/Fail and all accredited/non-accredited
$X^2 = 4.64$; df = 1, $X^2 = 3.84$

## TABLE 13

## EDUCATION, APPRENTICE AND JOB EXPERIENCES IN QUALITY CONTROL FOR CYTOTECHNOLOGISTS ACCORDING TO THE 1965 CERTIFICATION EXAMINATION[a] PERFORMANCE

| Experiences | Education[b] | | | | Apprentice[c] | | | | Present Job | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Total in Study | | Pass Exam[a] | Fail Exam[a] | Total in Study | | Pass Exam[a] | Fail Exam[a] | Total in Study | | Pass Exam[a] | Fail Exam[a] |
| | N[d] | %[d] | %[e] | %[e] | N[d] | %[d] | %[e] | %[e] | N[d] | %[d] | %[e] | %[e] |
| Number and percent of Cytotechnologists | 215 | 100 | 92 | 8 | 109 | 100 | 94 | 6 | 229 | 100 | 90 | 10 |
| 1. Identification & verification of specimens | | | | | | | | | | | | |
| a. Record appearance of all specimens on request/report forms immediately upon receipt in lab. | | | | | | | | | | | | |
| Yes[g] | 98 | 46 | 88 | 12 | 49 | 45 | 98 | 2 | 75 | 33 | 87 | 13 |
| Yes, other (non-genital only) | 62 | 29 | 94 | 6 | 19 | 17 | 84 | 16 | 38 | 17 | 92 | 8 |
| No, not done | 26 | 12 | 100 | 0 | 20 | 18 | 100 | 0 | 34 | 15 | 100 | 0 |
| Someone else does this | 17 | 8 | 94 | 6 | 12 | 11 | 100 | 0 | 61 | 27 | 90 | 10 |
| Other reply | 6 | 3 | 100 | 0 | 4 | 4 | 100 | 0 | 9 | 4 | 100 | 0 |
| No reply | 6 | 3 | 83 | 17 | 5 | 5 | 60 | 40 | 12 | 5 | 67 | 33 |
| b. Use of serial accession numbers for verifying patients' and case numbers | | | | | | | | | | | | |
| Yes[g] | 196 | 91 | 91 | 9 | 96 | 88 | 92 | 8 | 150 | 66 | 85 | 15 |
| No, not done | 1 | X[f] | 100 | 0 | 2 | 2 | 50 | 50 | 2 | X[f] | 100 | 0 |
| Someone else does this | 17 | 8 | 100 | 0 | 10 | 9 | 100 | 0 | 66 | 29 | 95 | 5 |
| Other reply | 0 | 0 | 0 | 0 | 1 | X[f] | 100 | 0 | 4 | 2 | 100 | 0 |
| No reply | 1 | X[f] | 100 | 0 | 0 | 0 | 100 | 0 | 7 | 3 | 71 | 29 |
| c. Record case number on equipment used to process non-genital cases | | | | | | | | | | | | |
| Yes[g] | 175 | 81 | 91 | 9 | 79 | 72 | 96 | 4 | 135 | 59 | 90 | 10 |
| No, not done | 17 | 8 | 100 | 0 | 11 | 10 | 91 | 9 | 19 | 8 | 89 | 11 |
| Someone else does this | 13 | 6 | 92 | 8 | 12 | 11 | 100 | 0 | 62 | 27 | 92 | 8 |
| Other reply | 3 | 1 | 100 | 0 | 1 | X[f] | 100 | 0 | 2 | X[f] | 100 | 0 |
| No reply | 7 | 3 | 100 | 0 | 6 | 6 | 67 | 33 | 11 | 5 | 82 | 8 |

TABLE 13
(continued)

| Experiences | Education$^b$ | | | | Apprentice$^c$ | | | | Present Job | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Total in Study | | Pass Exam$^a$ | Fail Exam$^a$ | Total in Study | | Pass Exam$^a$ | Fail Exam$^a$ | Total in Study | | Pass Exam$^a$ | Fail Exam$^a$ |
| | N$^d$ | %$^d$ | %$^e$ | %$^e$ | N$^d$ | %$^d$ | %$^e$ | %$^e$ | N$^d$ | %$^d$ | %$^e$ | %$^e$ |
| d. Check, routinely, patients' names &/or accession numbers on micro slides with those on request/report forms before processing | | | | | | | | | | | | |
| Yes$^g$ | 190 | 83 | 91 | 9 | 88 | 81 | 95 | 5 | 158 | 69 | 88 | 12 |
| No, not done | 6 | 3 | 100 | 0 | 4 | 4 | 100 | 0 | 6 | 3 | 100 | 0 |
| Someone else does this | 16 | 7 | 100 | 0 | 16 | 15 | 94 | 6 | 61 | 27 | 97 | 3 |
| No reply | 3 | 1 | 67 | 33 | 1 | x$^f$ | 0 | 100 | 4 | 2 | 50 | 50 |
| e. Record, routinely, the number of slides & filtration units made from a specimen or case at the beginning of processing | | | | | | | | | | | | |
| Yes$^g$ | 148 | 69 | 91 | 9 | 70 | 64 | 96 | 4 | 111 | 48 | 87 | 13 |
| No, not done | 39 | 18 | 92 | 8 | 16 | 15 | 100 | 0 | 43 | 19 | 93 | 7 |
| Someone else does this | 22 | 10 | 95 | 5 | 15 | 14 | 93 | 7 | 63 | 28 | 95 | 5 |
| Other reply | 1 | x$^f$ | 100 | 0 | 3 | 3 | 100 | 0 | 4 | 2 | 100 | 0 |
| No reply | 5 | 2 | 100 | 0 | 5 | 5 | 60 | 40 | 8 | 3 | 63 | 37 |
| Use this record to verify number of slides per case | | | | | | | | | | | | |
| Yes$^g$ | 149 | 69 | 92 | 8 | 70 | 64 | 96 | 4 | 126 | 55 | 88 | 12 |
| No, not done | 30 | 14 | 90 | 10 | 15 | 14 | 93 | 7 | 38 | 17 | 92 | 8 |
| Someone else does this | 16 | 7 | 100 | 0 | 13 | 12 | 92 | 8 | 44 | 19 | 98 | 2 |
| No reply | 20 | 9 | 85 | 15 | 11 | 10 | 91 | 9 | 21 | 9 | 81 | 19 |
| 2. Staining specimens | | | | | | | | | | | | |
| a. Regularly check shelf life of reagents & discard those that have expired | | | | | | | | | | | | |
| Yes$^g$ | 117 | 54 | 90 | 10 | 71 | 65 | 97 | 3 | 136 | 59 | 89 | 11 |
| No, not done | 20 | 9 | 90 | 10 | 11 | 10 | 100 | 0 | 19 | 8 | 89 | 11 |
| Someone else does this | 65 | 30 | 95 | 5 | 21 | 19 | 90 | 10 | 69 | 30 | 94 | 6 |
| Other reply | 2 | x$^f$ | 100 | 0 | 1 | x$^f$ | 100 | 0 | 1 | x$^f$ | 100 | 0 |
| No reply | 11 | 5 | 91 | 9 | 5 | 5 | 60 | 40 | 4 | 2 | 50 | 50 |

TABLE 13
(continued)

| Experiences | Education[b] | | | | Apprentice[c] | | | | Present Job | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Total in Study | | Pass Exam[a] | Fail Exam[a] | Total in Study | | Pass Exam[a] | Fail Exam[a] | Total in Study | | Pass Exam[a] | Fail Exam[a] |
| | N[d] | %[d] | %[e] | %[e] | N[d] | %[d] | %[e] | %[e] | N[d] | %[d] | %[e] | %[e] |
| 2. Staining specimens (continued) | | | | | | | | | | | | |
| b. Make stains and reagents used in the laboratory | | | | | | | | | | | | |
| Yes[g] | 85 | 40 | 91 | 9 | 28 | 26 | 96 | 4 | 39 | 17 | 87 | 13 |
| Yes[g], other (purchase some/make some; purchase all; centrally prepared in institution) | 95 | 44 | 91 | 9 | 71 | 65 | 97 | 3 | 129 | 56 | 90 | 10 |
| Someone else does this | 30 | 14 | 97 | 3 | 8 | 7 | 88 | 12 | 56 | 24 | 95 | 5 |
| Other reply | 1 | X[f] | 100 | 0 | 0 | 0 | 0 | 0 | 5 | 2 | 80 | 20 |
| No reply | 4 | 2 | 100 | 0 | 2 | 2 | 0 | 100 | 0 | 0 | 0 | 0 |
| c. Regularly examines slides for quality of staining, such as definition of intra-nuclear structure & intensity of nuclear stain, etc. | | | | | | | | | | | | |
| Yes[g] (each staining batch or daily) | 140 | 65 | 91 | 9 | 84 | 77 | 98 | 2 | 165 | 72 | 92 | 8 |
| Yes[g], other (weekly, change of stain, other) | 32 | 15 | 88 | 12 | 16 | 15 | 94 | 6 | 35 | 15 | 77 | 23 |
| No, not done | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Someone else does this | 29 | 13 | 93 | 7 | 4 | 4 | 75 | 25 | 22 | 10 | 91 | 9 |
| Other reply | 4 | 2 | 100 | 0 | 3 | 3 | 100 | 0 | 7 | 3 | 100 | 0 |
| No reply | 10 | 5 | 100 | 0 | 2 | 2 | 0 | 100 | 0 | 0 | 0 | 0 |
| d. Filter stains prior to use | | | | | | | | | | | | |
| Yes (each time slides stained, several times per day) | 54 | 25 | 94 | 6 | 22 | 19 | 77 | 23 | 27 | 12 | 93 | 7 |
| Yes[g], other (daily, weekly, other) | 135 | 63 | 89 | 11 | 72 | 66 | 99 | 1 | 123 | 54 | 87 | 13 |
| No, not done | 1 | X[f] | 100 | 0 | 1 | X[f] | 100 | 0 | 1 | X[f] | 100 | 0 |
| Someone else does this | 17 | 8 | 100 | 0 | 11 | 10 | 100 | 0 | 73 | 32 | 95 | 5 |
| Other reply | 3 | 1 | 100 | 0 | 3 | 3 | 100 | 0 | 4 | 2 | 100 | 0 |
| No reply | 5 | 2 | 100 | 0 | 0 | 0 | 0 | 0 | 1 | X[f] | 0 | 100 |

TABLE 13
(continued)

| Experiences | Education$^b$ | | | | Apprentice$^c$ | | | | Present Job | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Total in Study | | Pass Exam$^a$ | Fail Exam$^a$ | Total in Study | | Pass Exam$^a$ | Fail Exam$^a$ | Total in Study | | Pass Exam$^a$ | Fail Exam$^a$ |
| | N$^d$ | %$^d$ | %$^e$ | %$^e$ | N$^d$ | %$^d$ | %$^e$ | %$^e$ | N$^d$ | %$^d$ | %$^e$ | %$^e$ |
| 2. e. Filter alcohols for staining prior to use | | | | | | | | | | | | |
| Yes (each time slides stained, several times per day).......... | 30 | 14 | 93 | 7 | 9 | 8 | 78 | 22 | 12 | 5 | 83 | 17 |
| Yes$^g$, other (daily, weekly, other)......................... | 99 | 46 | 90 | 10 | 43 | 39 | 98 | 2 | 74 | 32 | 86 | 14 |
| No, not done.................... | 52 | 24 | 94 | 6 | 37 | 34 | 100 | 0 | 68 | 30 | 96 | 4 |
| Someone else does this.......... | 20 | 9 | 90 | 10 | 12 | 11 | 92 | 8 | 66 | 29 | 91 | 9 |
| Other reply..................... | 3 | 1 | 100 | 0 | 5 | 5 | 100 | 0 | 7 | 3 | 100 | 0 |
| No reply........................ | 11 | 5 | 91 | 9 | 3 | 3 | 33 | 67 | 2 | X$^f$ | 0 | 100 |
| f. Frequency of changing stains in staining dishes | | | | | | | | | | | | |
| Yes, (daily).................... | 26 | 12 | 77 | 23 | 6 | 6 | 83 | 17 | 6 | 3 | 50 | 50 |
| Yes$^g$, other (weekly, monthly, as needed)....................... | 153 | 71 | 94 | 6 | 87 | 80 | 97 | 3 | 146 | 64 | 90 | 10 |
| Someone else does this.......... | 27 | 13 | 89 | 11 | 14 | 13 | 100 | 0 | 71 | 31 | 94 | 6 |
| No reply........................ | 9 | 4 | 100 | 0 | 2 | 2 | 0 | 100 | 6 | 3 | 83 | 17 |
| g. Frequency of changing alcohols solutions used in staining | | | | | | | | | | | | |
| Yes$^g$ (daily).................... | 59 | 27 | 92 | 8 | 22 | 20 | 95 | 5 | 28 | 12 | 89 | 11 |
| Yes$^g$, other (weekly, bi-weekly, monthly, as needed)............. | 127 | 59 | 91 | 9 | 74 | 68 | 96 | 4 | 120 | 52 | 89 | 11 |
| Someone else does this.......... | 20 | 9 | 95 | 5 | 13 | 12 | 85 | 15 | 75 | 33 | 93 | 7 |
| No reply........................ | 9 | 4 | 89 | 11 | 0 | 0 | 0 | 0 | 6 | 3 | 67 | 33 |
| h. Separate staining of body cavity fluids (hypercellular specimens) | | | | | | | | | | | | |
| Yes$^g$ ........................... | 141 | 66 | 90 | 10 | 50 | 46 | 94 | 6 | 81 | 35 | 84 | 16 |
| No, not done.................... | 42 | 20 | 95 | 5 | 39 | 36 | 97 | 3 | 67 | 29 | 93 | 7 |
| Someone else does this.......... | 19 | 9 | 95 | 5 | 14 | 13 | 100 | 0 | 65 | 28 | 95 | 5 |
| Other reply..................... | 0 | 0 | 0 | 0 | 2 | 2 | 100 | 0 | 3 | 1 | 100 | 0 |
| No reply........................ | 13 | 6 | 92 | 8 | 4 | 4 | 50 | 50 | 13 | 6 | 85 | 15 |

## Footnotes for Table 13

a. This refers to the examination given annually by the Board of Registry of Medical Technologists (ASCP) for certification of cytotechnologists. "Pass Exam" and "Fail Exam" refer to cytotechnologists who passed and failed the 1965 certification examination.

b. "Education" refers to the experiences in the school of cytotechnology.

c. "Apprentice" refers to the experiences in laboratories which are not accredited as schools of cytotechnology where some of the cytotechnologists received their training. Some of them spent the second half of their 12 month training program in these laboratories to fulfill the certification requirements. Others received their training in these laboratories prior to the accreditation of schools of cytotechnology.

d. The summations of N (number) and % (percent) for each of the sections (Education, Apprentice and Present Job) follow the vertical dimension of the table. The percents are based respectively on 215 cytotechnologists (Education), 109 cytotechnologists (Apprentice) and 229 cytotechnologists (Present Job).

e. The summations of % (percent) for each of the three sections (Education, Apprentice, and Present Job) follow the horizontal dimension of the table. The percents are based on the N (number) in the corresponding parallel columns for each section. For example: 98 people said that they record the appearance of all specimens upon receipt in the laboratory and of these 88% passed the 1965 certification examination and 12% failed.

f. X = Less than 1%.

g. Calculation of chi square test for distribution of those who passed and failed the 1965 certification examination in each section shows that these figures are not statistically significant. Range of $X^2 = 0.02$ through 1.95; df = 2, $X^2 = 5.99$ (0.05 probability level)

## TABLE 14

## EDUCATION EXPERIENCES TRANSFERRED
## TO
## JOB EXPERIENCES IN QUALITY CONTROL MEASURES

| Experiences | Education[a] | | Present Job[a] | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Replies | | Yes | Yes, Other | No, not done | Someone else does | Other reply | No reply |
| | N[b] | %[b] | %[c] | %[c] | %[c] | %[c] | %[c] | %[c] |
| Cytotechnologists with the following educational experiences and related job experiences.............. | 215 | 100 | | | | | | |
| 1. Identification & verification of specimens | | | | | | | | |
| a. Record appearance of all specimens on request/report forms immediately upon receipt in lab. | | | | | | | | |
| Yes........................................ | 98 | 46 | (56) | 3 | 1 | 24 | 1 | 15 |
| Yes, other (non-genital only)................. | 62 | 29 | 5 | (44) | 19 | 23 | 2 | 8 |
| No, not done................................. | 26 | 12 | 4 | 8 | (81) | 8 | 0 | 0 |
| Someone else does this....................... | 17 | 8 | 24 | 12 | 0 | (47) | 0 | 18 |
| Other reply.................................. | 6 | 3 | 0 | 0 | 0 | 0 | (83) | 17 |
| No reply..................................... | 6 | 3 | 17 | 17 | 0 | 0 | 0 | (67) |
| b. Use of serial accession numbers for verifying patients' and case numbers | | | | | | | | |
| Yes........................................ | 196 | 91 | (64) | | 1 | 23 | 2 | 11 |
| No, not done................................. | 1 | x[d] | 0 | | (100) | 0 | 0 | 0 |
| Someone else does this....................... | 17 | 8 | 35 | | 0 | (53) | 0 | 12 |
| Other reply.................................. | 0 | 0 | 0 | | 0 | 0 | 0 | 0 |
| No reply..................................... | 1 | x[d] | 0 | | 0 | (100) | 0 | 0 |
| c. Record case number on equipment to process non-genital cases | | | | | | | | |
| Yes........................................ | 175 | 81 | (65) | | 2 | 24 | x[d] | 9 |
| No, not done................................. | 17 | 8 | 6 | | (77) | 6 | 0 | 12 |
| Someone else does this....................... | 13 | 6 | 8 | | 0 | (62) | 0 | 31 |
| Other reply.................................. | 3 | 1 | 33 | | 0 | 0 | (33) | 33 |
| No reply..................................... | 7 | 3 | 29 | | 0 | 14 | 0 | (57) |

TABLE 14
(continued)

| Experiences | Education$^a$ | | Present Job$^a$ | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Replies | | Yes | Yes Other | No, not done | Someone else does | Other reply | No reply |
| | N$^b$ | %$^b$ | %$^c$ | %$^c$ | %$^c$ | %$^c$ | %$^c$ | %$^c$ |
| 1. d. Check, routinely, patients' names &/or accession numbers on micro slides with those on request/report forms before processing | | | | | | | | |
| Yes | 190 | 88 | (68) | | 1 | 22 | | 10 |
| No, not done | 6 | 3 | 50 | | (50) | 0 | | 0 |
| Someone else does this | 16 | 7 | 31 | | 0 | (56) | | 13 |
| No reply | 3 | 1 | 33 | | 0 | 33 | | (33) |
| e. Record, routinely, the number of slides & filtration units made from a specimen or case at the beginning of processing | | | | | | | | |
| Yes | 148 | 69 | (57) | | 8 | 24 | $x^d$ | 10 |
| No, not done | 39 | 18 | 23 | | (69) | 3 | 3 | 3 |
| Someone else does this | 22 | 10 | 18 | | 5 | (50) | 0 | 27 |
| Other reply | 1 | $x^d$ | 0 | | 0 | 0 | (100) | 0 |
| No reply | 5 | 2 | (60) | | 0 | 20 | 0 | 20 |
| Use this record to verify number of slides per case | | | | | | | | |
| Yes | 149 | 69 | (66) | | 8 | 17 | | 9 |
| No, not done | 30 | 14 | 23 | | (73) | 0 | | 3 |
| Someone else does this | 16 | 7 | 19 | | 6 | (50) | | 25 |
| No reply | 20 | 9 | 10 | | 0 | 5 | | (85) |
| 2. Staining specimens | | | | | | | | |
| a. Regularly check shelf life of reagents & discard those that have expires | | | | | | | | |
| Yes | 117 | 54 | (66) | | 0 | 25 | 0 | 9 |
| No, not done | 20 | 9 | 25 | | (65) | 5 | 0 | 5 |
| Someone else does this | 65 | 30 | 42 | | 5 | (42) | 0 | 12 |
| Other reply | 2 | $x^d$ | 0 | | 50 | 0 | (50) | 0 |
| No reply | 11 | 5 | (55) | | 9 | 18 | 0 | 18 |

TABLE 14
(continued)

| Experiences | Education$^{a}$ |  | Present Job$^{a}$ |  |  |  |  |  |
|---|---|---|---|---|---|---|---|---|
|  | Replies |  | Yes | Yes, Other | No, not done | Someone else does | Other reply | No reply |
|  | N$^{b}$ | %$^{b}$ | %$^{c}$ | %$^{c}$ | %$^{c}$ | %$^{c}$ | %$^{c}$ | %$^{c}$ |
| 2. b. Makes stains & reagents used in the lab. |  |  |  |  |  |  |  |  |
| Yes.......................................... | 85 | 40 | 28 | (39) |  | 20 | 2 | 11 |
| Yes, other (purchase some/make some; purchase all; centrally prepared in institution)....... | 95 | 44 | 3 | (68) |  | 20 | 2 | 6 |
| Someone else does this....................... | 30 | 14 | 23 | 33 |  | (33) | 0 | 10 |
| Other reply.................................. | 1 | X$^{d}$ | 0 | 0 |  | 0 | 0 | (100) |
| No reply..................................... | 4 | 2 | 0 | (75) |  | 25 | 0 | 0 |
| c. Regularly examines slides for quality of staining; such as definition of intra-nuclear structure & intensity of nuclear stain, etc. |  |  |  |  |  |  |  |  |
| Yes, (each staining batch or daily)........... | 140 | 65 | (80) | 7 | 0 | 5 | 0 | 8 |
| Yes, other (weekly, change of stain, other)... | 32 | 15 | 22 | (47) | 0 | 16 | 3 | 12 |
| No, not done................................. | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Someone else does this....................... | 29 | 13 | (55) | 17 | 0 | 21 | 0 | 7 |
| Other reply.................................. | 4 | 2 | 0 | 0 | 0 | 0 | (100) | 0 |
| No reply..................................... | 10 | 5 | (70) | 10 | 0 | 10 | 0 | 10 |
| d. Filter stains prior to use |  |  |  |  |  |  |  |  |
| Yes (each time slides are stained, several times per day)................................ | 54 | 25 | 30 | 19 | 2 | (35) | 2 | 13 |
| Yes, other (daily, weekly, other)............ | 134 | 62 | 2 | (66) | 0 | 23 | X$^{d}$ | 7 |
| No, not done................................. | 1 | X$^{d}$ | 0 | (100) | 0 | 0 | 0 | 0 |
| Someone else does this....................... | 17 | 8 | 0 | 41 | 0 | (53) | 0 | 6 |
| Other reply.................................. | 3 | 1 | 0 | 0 | 0 | 33 | (67) | 0 |
| No reply..................................... | 6 | 3 | 33 | (50) | 0 | 0 | 0 | 17 |
| e. Filter alcohols for staining prior to use |  |  |  |  |  |  |  |  |
| Yes (each time slides are stained, several times per day)................................ | 30 | 14 | 30 | 13 | 3 | 30 | 3 | 20 |
| Yes, other (daily, weekly, other)............ | 98 | 46 | 1 | (53) | 6 | 28 | 4 | 8 |
| No, not done................................. | 52 | 24 | 0 | 0 | (92) | 6 | 0 | 2 |
| Someone else does this....................... | 20 | 9 | 0 | 20 | 15 | (50) | 0 | 15 |
| Other reply.................................. | 3 | 1 | 0 | 0 | 0 | (67) | 33 | 0 |
| No reply..................................... | 12 | 6 | 8 | (42) | 8 | 17 | 8 | 17 |

TABLE 14
(continued)

| Experiences | Education[a] | | Present Job[a] | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Replies | | Yes | Yes, other | No, not done | Someone else does | Other reply | No reply |
| | N[b] | %[b] | %[c] | %[c] | %[c] | %[c] | %[c] | %[c] |
| 2. f. Frequency of changing stains in staining dishes | | | | | | | | |
| Yes, (daily) | 26 | 12 | 15 | (46) | | 27 | | 12 |
| Yes, other (weekly, bi-weekly, monthly, as needed) | 153 | 71 | 1 | (65) | | 25 | | 8 |
| Someone else does this | 27 | 13 | 0 | 33 | | (52) | | 15 |
| No reply | 9 | 4 | 0 | (66) | | 0 | | 33 |
| g. Frequency of changing alcohol solutions used in staining | | | | | | | | |
| Yes, (daily) | 59 | 27 | (36) | 24 | | 29 | | 12 |
| Yes, Other (weekly, bi-weekly, monthly, as needed) | 127 | 59 | 3 | (65) | | 24 | | 9 |
| Someone else does this | 20 | 9 | 5 | (80) | | 0 | | 15 |
| No reply | 9 | 4 | 11 | (56) | | 11 | | 22 |
| h. Separate staining of body cavity fluids (hypercellular specimens) | | | | | | | | |
| Yes | 141 | 66 | (43) | | 18 | 27 | 1 | 11 |
| No, not done | 42 | 20 | 5 | | (74) | 12 | 2 | 7 |
| Someone else does this | 19 | 9 | 16 | | 11 | (58) | 0 | 16 |
| Other reply | 0 | 0 | 0 | | 0 | 0 | 0 | 0 |
| No reply | 13 | 6 | 23 | | 15 | 8 | 0 | (54) |

a. "Education" refers to the experiences (performance of duties) in the school of cytotechnology. "Present Job" refers to the experiences (performance of duties) on the jobs the cytotechnologists presently hold. This table shows the N (number) and % (percent) of cytotechnologists who had the listed experiences in the school of cytotechnology and either are repeating them on their jobs or, if not, what other experiences they indicated.
For example: Of the 98 cytotechnologists who recorded appearance of all specimens during their education;
56% said they do so on their jobs,
3% said they record only non-genital specimens,
1% said it is not done at all on their jobs,
24% said someone else does this,
1% gave a reply not included in the tabulating code,
15% did not reply.
The largest percent for each response on the job is placed in parentheses to facilitate location of trends in education and job experiences.

## Footnotes for Table 14
(continued)

b. The summations of N (number) and % (percent) for Education follow the vertical dimension of the table. All percents are based on 215 people who indicated school experiences. The remaining 34 of the 249 cytotechnologists did not indicate experiences for the school of cytotechnology.

c. The summations of % (percent) for Present Job follow the horizontal dimension of the table. The percents are based on the N (number) in the corresponding parallel column (Education). For example see footnote a.

d. X = Less than 1%.

## TABLE 15

## JOB EXPERIENCES LEARNED AS EDUCATION EXPERIENCES
## in
## QUALITY CONTROL MEASURES

| Experiences | Present Job[a] | | Education[a] | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Replies | | Yes | Yes, Other | No, not done | Someone else does | Other reply | No Reply |
| | N[b] | %[b] | %[c] | %[c] | %[c] | %[c] | %[c] | %[c] |
| Cytotechnologists with the following job experiences and related educational experiences.......... | 229 | 100 | | | | | | |
| 1. Identification & verification of specimens | | | | | | | | |
| a. Record appearance of all specimens on request/report forms immediately upon receipt in lab. | | | | | | | | |
| Yes........................................ | 75 | 33 | (73) | 4 | 1 | 5 | 0 | 16 |
| Yes, other (non-genital only).............. | 38 | 17 | 8 | (71) | 5 | 5 | 0 | 11 |
| No, not done............................... | 34 | 15 | 3 | 35 | (62) | 0 | 0 | 0 |
| Someone else does this..................... | 61 | 27 | (38) | 23 | 3 | 13 | 0 | 23 |
| Other reply................................ | 9 | 4 | 11 | 11 | 0 | 0 | (56) | 22 |
| No reply................................... | 12 | 5 | 42 | 17 | 0 | 0 | 0 | (42) |
| b. Use of serial accession numbers for verifying patients' and case numbers | | | | | | | | |
| Yes........................................ | 150 | 66 | (83) | | X[d] | 3 | X[d] | 12 |
| No, not done............................... | 2 | X[d] | 0 | | (100) | 0 | 0 | 0 |
| Someone else does this..................... | 66 | 29 | (68) | | 0 | 14 | 0 | 18 |
| Other reply................................ | 4 | 2 | (75) | | 0 | 0 | 0 | 25 |
| No reply................................... | 7 | 3 | (71) | | 0 | 0 | 0 | 29 |
| c. Record case number on equipment used to process non-genital cases | | | | | | | | |
| Yes........................................ | 135 | 59 | (84) | | X[d] | X[d] | X[d] | 14 |
| No, not done............................... | 19 | 8 | 21 | | (68) | 0 | 0 | 11 |
| Someone else does this..................... | 62 | 27 | (68) | | 2 | 13 | 0 | 18 |
| Other reply................................ | 2 | X[d] | 50 | | 0 | 0 | (50) | 0 |
| No reply................................... | 11 | 5 | 27 | | 0 | 0 | 9 | (64) |

TABLE 15
(continued)

| Experiences | Present Job[a] |  | Education[a] |  |  |  |  |  |
|---|---|---|---|---|---|---|---|---|
|  | Replies |  | Yes | Yes, Other | No, not done | Someone else does | Other reply | No reply |
|  | N[b] | %[b] | %[c] | %[c] | %[c] | %[c] | %[c] | %[c] |
| 1. d. Check, routinely, patients' names &/or accession numbers on micro slides with those on request/report forms before processing |  |  |  |  |  |  |  |  |
| Yes | 158 | 69 | (82) |  | 2 | 3 |  | 13 |
| No, not done | 6 | 3 | 33 |  | (50) | 0 |  | 17 |
| Someone else does this | 61 | 27 | (67) |  | 0 | 15 |  | 18 |
| No reply | 4 | 2 | 50 |  | 0 | 0 |  | (50) |
| e. Record, routinely, the number of slides & filtration units made from a specimen or case at the beginning of processing |  |  |  |  |  |  |  |  |
| Yes | 111 | 48 | (76) |  | 8 | 4 | 0 | 13 |
| No, not done | 43 | 19 | 28 |  | (63) | 2 | 0 | 7 |
| Someone else does this | 63 | 28 | (57) |  | 2 | 18 | 0 | 24 |
| Other reply | 4 | 2 | 25 |  | 25 | 0 | 25 | 25 |
| No reply | 8 | 3 | 25 |  | 0 | 25 | 0 | (50) |
| Use this record to verify number of slides per case |  |  |  |  |  |  |  |  |
| Yes | 126 | 55 | (78) |  | 6 | 2 |  | 14 |
| No, not done | 38 | 17 | 32 |  | (58) | 3 |  | 8 |
| Someone else does this | 44 | 19 | (57) |  | 0 | 18 |  | 25 |
| No reply | 21 | 9 | 10 |  | 0 | 5 |  | (86) |
| 2. Staining specimens<br>a. Regularly check shelf life of reagents & discard those that have expired |  |  |  |  |  |  |  |  |
| Yes | 136 | 59 | (57) |  | 4 | 20 | 0 | 20 |
| No, not done | 19 | 8 | 0 |  | (68) | 16 | 5 | 11 |
| Someone else does this | 69 | 30 | (42) |  | 1 | 39 | 0 | 17 |
| Other reply | 1 | x[d] | 0 |  | 0 | 0 | (100) | 0 |
| No reply | 4 | 2 | 25 |  | 0 | 25 | 0 | (50) |

TABLE 15
(continued)

| Experiences | Present Job[a] | | Education[a] | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Replies | | Yes | Yes, Other | No, not done | Someone else does | Other reply | No reply |
| | N[b] | %[b] | %[c] | %[c] | %[c] | %[c] | %[c] | %[c] |
| 2. b. Make stains & reagents used in the lab. | | | | | | | | |
| Yes.................................... | 39 | 17 | (62) | 8 | | 18 | 3 | 10 |
| Yes, other (purchase some/make some; purchase all; centrally prepared in institution)..................................... | 129 | 56 | 26 | (50) | | 8 | 0 | 16 |
| Someone else does this..................... | 56 | 24 | 30 | (34) | | 18 | 0 | 18 |
| Other reply.............................. | 5 | 2 | 40 | (40) | | 0 | 0 | 20 |
| c. Regularly examines slides for quality of staining; such as definition of intranuclear structure & intensity of nuclear stain, etc. | | | | | | | | |
| Yes (each staining batch or daily).......... | 165 | 72 | (68) | 5 | 0 | 10 | 0 | 18 |
| Yes, other (weekly, change of stain, other) | 34 | 15 | 29 | (44) | 0 | 15 | 0 | 12 |
| No, not done.............................. | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Someone else does this..................... | 21 | 9 | (33) | 24 | 0 | 24 | 0 | 19 |
| Other reply.............................. | 7 | 3 | 0 | 14 | 0 | 0 | (57) | 29 |
| No reply................................. | 2 | X[d] | 50 | 0 | 0 | 50 | 0 | 0 |
| d. Filter stains prior to use | | | | | | | | |
| Yes, (each time slides stained, several times per day)............................ | 27 | 12 | (59) | 11 | 0 | 0 | 0 | 30 |
| Yes, other (daily, weekly, other).......... | 123 | 54 | 8 | (72) | X[d] | 6 | 0 | 13 |
| No, not done.............................. | 1 | X[d] | 100 | 0 | 0 | 0 | 0 | 0 |
| Someone else does this..................... | 73 | 32 | 26 | (44) | 0 | 12 | 1 | 16 |
| Other reply.............................. | 4 | 2 | 25 | 25 | 0 | 0 | (50) | 0 |
| No reply................................. | 1 | X[d] | 0 | (100) | 0 | 0 | 0 | 0 |

TABLE 15
(continued)

| Experiences | Present Job[a] |  | Education[a] |  |  |  |  |  |
|---|---|---|---|---|---|---|---|---|
|  | Replies |  | Yes | Yes, other | No, not done | Someone else does | Other reply | No reply |
|  | N[b] | %[b] | %[c] | %[c] | %[c] | %[c] | %[c] | %[c] |
| 2. e. Filter alcohols for staining prior to use |  |  |  |  |  |  |  |  |
| Yes, (each time slides stained, several times per day) | 12 | 5 | (75) | 8 | 0 | 0 | 0 | 17 |
| Yes, other (daily, weekly, other) | 74 | 32 | 5 | (70) | 0 | 5 | 0 | 19 |
| No, not done | 68 | 30 | 2 | 9 | (71) | 4 | 0 | 15 |
| Someone else does this | 66 | 29 | 14 | (42) | 5 | 15 | 3 | 21 |
| Other reply | 7 | 3 | 14 | (57) | 0 | 0 | 14 | 14 |
| No reply | 2 | X[d] | 0 | 100 | 0 | 0 | 0 | 0 |
| f. Frequency of changing stains in staining dishes |  |  |  |  |  |  |  |  |
| Yes, (daily) | 6 | 3 | (67) | 33 |  | 0 |  | 0 |
| Yes, other (weekly, bi-weekly, monthly, as needed) | 146 | 64 | 8 | (68) |  | 6 |  | 17 |
| Someone else does this | 71 | 31 | 10 | (55) |  | 20 |  | 16 |
| No reply | 6 | 3 | 0 | 33 |  | 0 |  | (67) |
| g. Frequency of changing alcohol solutions used in staining |  |  |  |  |  |  |  |  |
| Yes, (daily) | 28 | 12 | (75) | 14 |  | 4 |  | 7 |
| Yes, other (weekly, bi-weekly, monthly, as needed) | 120 | 52 | 12 | (68) |  | 3 |  | 17 |
| Someone else does this | 75 | 33 | 23 | (40) |  | 16 |  | 21 |
| No reply | 6 | 3 | 17 | 33 |  | 17 |  | 33 |
| h. Separate staining of body cavity fluids (hypercellular specimens) |  |  |  |  |  |  |  |  |
| Yes | 81 | 35 | (74) |  | 3 | 4 | 0 | 20 |
| No, not done | 67 | 29 | 37 |  | (46) | 3 | 0 | 13 |
| Someone else does this | 65 | 28 | (59) |  | 8 | 17 | 0 | 17 |
| Other reply | 3 | 1 | (67) |  | 33 | 0 | 0 | 0 |
| No reply | 13 | 6 | 23 |  | 8 | 8 | 0 | (62) |

## Footnotes for Table 15

a. "Present Job" refers to the experience (performance of duties) on the jobs the cytotechnologists presently hold. "Education" refers to the experiences (performance of duties) in the school of cytotechnology. This table shows the N (number) and % (percent) of cytotechnologists who had the listed experiences in the school of cytotechnology and either are repeating them on their jobs or, if not, what other experiences they indicated.
For example: Of the 75 cytotechnologists who record appearance of all specimens on their jobs,
73% also did so in their training programs,
4% did only non-genitals in their training programs,
1% did not do this in their training programs,
5% were in programs where someone else did this,
16% did not reply for education (training) program experience.
The largest percent for each response in the education (training) program is placed in parentheses to facilitate location of trends in job and education experiences.

b. The summations of N (number) and % (percent) for Present Job follow the vertical dimension of the table. All percents are based on 229 people who indicated job experiences. The remaining 20 of the 249 cytotechnologists did not indicate job experiences.

c. The summations of % (percent) for Education follow the horizontal dimension of the table. The percents are based on the N (number) in the corresponding parallel column (Present Job). For example see footnote a.

d. X = Less than 1%.

## TABLE 16

## APPRENTICE AND JOB EXPERIENCES IN QUALITY CONTROL MEASURES

| Experiences | Apprentice[a] |  | Present Job[a] |  |  |  |  |  |
|---|---|---|---|---|---|---|---|---|
|  | Replies |  | Yes | Yes, other | No, not done | Someone else does | Other reply | No reply |
|  | N [b] | % [b] | %[c] | % [c] | %[c] | %[c] | %[c] | %[c] |
| Cytotechnologists with the following apprentice experiences and related job experiences............ | 109 | 100 |  |  |  |  |  |  |
| 1. Identification & verification of specimens |  |  |  |  |  |  |  |  |
| a. Record appearance of all specimens on request/report forms immediately upon receipt in laboratory |  |  |  |  |  |  |  |  |
| Yes.................................... | 49 | 45 | (55) | 0 | 0 | 37 | 2 | 6 |
| Yes, other (non-genital).................. | 19 | 17 | 0 | (53) | 11 | 16 | 5 | 16 |
| No, not done.......................... | 20 | 18 | 0 | 0 | (90) | 5 | 0 | 5 |
| Someone else does this.................. | 12 | 11 | 42 | 0 | 0 | (58) | 0 | 0 |
| Other reply........................... | 4 | 4 | 0 | 25 | 0 | 0 | (75) | 0 |
| No reply.............................. | 5 | 5 | 0 | 20 | 0 | 20 | 0 | (60) |
| b. Use of serial accession numbers for verifying patients' and case numbers |  |  |  |  |  |  |  |  |
| Yes.................................... | 95 | 87 | (65) |  | 2 | 26 | 1 | 5 |
| No, not done.......................... | 2 | 2 | 50 |  | 0 | 0 | 0 | 50 |
| Someone else does this.................. | 10 | 9 | 30 |  | 0 | (70) | 0 | 0 |
| Other reply............................ | 1 | X[d] | 0 |  | 0 | 0 | (100) | 0 |
| No reply .............................. | 1 | X[d] | 0 |  | 0 | 0 | 0 | (100) |
| c. Record case number on equipment used to process non-genital cases |  |  |  |  |  |  |  |  |
| Yes.................................... | 78 | 72 | (65) |  | 3 | 30 | 0 | 3 |
| No, not done.......................... | 11 | 10 | 0 |  | (73) | 0 | 0 | 27 |
| Someone else does this.................. | 12 | 11 | 42 |  | 0 | (58) | 0 | 0 |
| Other reply............................ | 1 | X[d] | 0 |  | 0 | 0 | (100) | 0 |
| No reply............................... | 7 | 6 | 14 |  | 0 | 14 | 0 | (71) |

## TABLE 16
(continued)

| Experiences | Apprentice[a] | | Present Job[a] | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Replies | | Yes | Yes, other | No, not done | Someone else does | Other reply | No reply |
| | N[b] | %[b] | %[c] | %[c] | %[c] | %[c] | %[c] | %[c] |
| 1. d. Check, routinely, patients' names &/or accession numbers on micro slides with those on request/report forms before processing | | | | | | | | |
| Yes | 87 | 80 | (72) | | 0 | 23 | 0 | 5 |
| No, not done | 4 | 4 | 0 | | (100) | 0 | 0 | 0 |
| Someone else does this | 16 | 15 | 31 | | 0 | (63) | 0 | 6 |
| Other reply | 0 | 0 | 0 | | 0 | 0 | 0 | 0 |
| No reply | 2 | 2 | 50 | | 0 | 0 | 0 | 50 |
| e. Record, **routinely,** the number of slides & filtration units made from a specimen or case at the beginning of processing | | | | | | | | |
| Yes | 70 | 64 | (56) | | 7 | 30 | 0 | 7 |
| No, not done | 16 | 15 | 13 | | (81) | 6 | 0 | 0 |
| Someone else does this | 15 | 14 | 33 | | 0 | (53) | 0 | 13 |
| Other reply | 3 | 3 | 0 | | 0 | 0 | (100) | 0 |
| No reply | 5 | 5 | 20 | | 0 | 0 | 20 | (60) |
| Use this record to verify number of slides per case | | | | | | | | |
| Yes | 70 | 64 | (70) | | 6 | 19 | 0 | 6 |
| No, not done | 15 | 14 | 7 | | (80) | 7 | 0 | 7 |
| Someone else does this | 13 | 12 | 23 | | 0 | (69) | 0 | 8 |
| No reply | 11 | 10 | 9 | | 0 | 0 | 0 | (91) |
| 2. Staining specimens | | | | | | | | |
| a. Regularly check shelf life of reagents & discard those that have expired | | | | | | | | |
| Yes | 71 | 65 | (70) | | 0 | 25 | 0 | 4 |
| No, not done | 11 | 10 | 18 | | (64) | 18 | 0 | 0 |
| Someone else does this | 21 | 19 | (48) | | 0 | 43 | 0 | 10 |
| Other reply | 1 | X[d] | 0 | | 0 | 0 | (100) | 0 |
| No reply | 5 | 5 | 40 | | 0 | 20 | 0 | 40 |

TABLE 16
(continued)

| Experiences | Apprentice[a] | | Present Job[a] | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Replies | | Yes | Yes other | No, not done | Someone else does | Other reply | No reply |
| | N[b] | %[b] | %[c] | %[c] | %[c] | %[c] | %[c] | %[c] |
| 2. b. Make stains & reagents used in the lab. | | | | | | | | |
| Yes | 28 | 26 | (50) | 21 | | 25 | 0 | 4 |
| Yes, other (purchase some/make some; purchase all; centrally prepared in institution) | 71 | 65 | 6 | (65) | | 21 | 4 | 4 |
| Someone else does this | 8 | 7 | 13 | 25 | | (50) | 0 | 13 |
| Other reply | 0 | 0 | 0 | 0 | | 0 | 0 | 0 |
| No reply | 2 | 2 | 0 | 50 | | 0 | 0 | (50) |
| c. Regularly examines slides for quality of staining, such as definition of intranuclear structure & intensity of nuclear stain, etc. | | | | | | | | |
| Yes, (each staining batch or daily) | 83 | 76 | (86) | 2 | 0 | 6 | 0 | 6 |
| Yes, other (weekly, change of stain, other) | 16 | 15 | 25 | (44) | 0 | 13 | 6 | 13 |
| No, not done | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Someone else does this | 4 | 4 | (100) | 0 | 0 | 0 | 0 | 0 |
| Other reply | 3 | 3 | 33 | 0 | 0 | 0 | (67) | 0 |
| No reply | 3 | 3 | (67) | 0 | 0 | 0 | 33 | 0 |
| d. Filter stains prior to use | | | | | | | | |
| Yes, (each time slides stained, several times per day) | 21 | 19 | (48) | 10 | 0 | 24 | 0 | 19 |
| Yes, other (daily, weekly, other) | 72 | 66[d] | 3 | (64) | 1 | 29 | 0 | 3 |
| No, not done | 1 | X[d] | 0 | (100) | 0 | 0 | 0 | 0 |
| Someone else does this | 11 | 10 | 9 | 27 | 0 | (64) | 0 | 0 |
| Other reply | 3 | 3[d] | 0 | 0 | 0 | 33 | (67) | 0 |
| No reply | 1 | X[d] | 0 | 0 | 0 | (100) | 0 | 0 |

## TABLE 16
(continued)

|  | Apprentice[a] |  | Present Job[a] |  |  |  |  |  |
|---|---|---|---|---|---|---|---|---|
| Experiences | Replies |  | Yes | Yes, other | No, not done | Someone else does | Other reply | No reply |
|  | N[b] | %[b] | %[c] | %[c] | %[c] | %[c] | %[c] | %[c] |
| 2. e. Filter alcohols for staining prior to use |  |  |  |  |  |  |  |  |
| Yes, (each time slides stained, several times per day)........................... | 9 | 8 | 22 | 11 | 0 | (33) | 0 | 33 |
| Yes, other (daily, weekly, other).......... | 43 | 39 | 0 | (51) | 7 | 37 | 0 | 5 |
| Someone else does this.................... | 12 | 11 | 0 | 17 | 17 | (67) | 0 | 0 |
| Other reply................................ | 5 | 5 | 0 | 0 | 0 | 40 | (60) | 0 |
| No reply.................................. | 3 | 3 | 0 | (67) | 0 | 33 | 0 | 0 |
| No, not done.............................. | 37 | 34 | 0 | 5 | (81) | 11 | 0 | 3 |
| f. Frequency of changing stains in staining dishes |  |  |  |  |  |  |  |  |
| Yes, (daily)............................... | 6 | 6 | 17 | 33 |  | (50) |  | 0 |
| Yes, other (weekly, bi-weekly, monthly, as needed)................................ | 86 | 79 | 0 | (64) |  | 29 |  | 7 |
| Someone else does this.................... | 14 | 13 | 0 | (57) |  | 43 |  | 0 |
| No reply.................................. | 3 | 3 | 33 | 0 |  | 33 |  | 33 |
| g. Frequency of changing alcohol solutions used in staining |  |  |  |  |  |  |  |  |
| Yes, (daily)............................... | 22 | 20 | 32 | 9 |  | (50) |  | 9 |
| Yes, other (weekly, bi-weekly, monthly, as needed)................................ | 73 | 67 | 1 | (66) |  | 29 |  | 5 |
| Someone else does this.................... | 13 | 12 | 0 | 46 |  | (54) |  | 0 |
| No reply.................................. | 1 | x[d] | 0 | 0 |  | 0 |  | (100) |
| h. Separate staining of body cavity fluids (hypercellular specimens) |  |  |  |  |  |  |  |  |
| Yes........................................ | 50 | 46 | (48) |  | 6 | 36 | 0 | 10 |
| No, not done.............................. | 39 | 36 | 5 |  | (72) | 15 | 0 | 8 |
| Someone else does this.................... | 13 | 12 | 46 |  | 8 | 46 | 0 | 0 |
| Other reply................................ | 2 | 2 | 0 |  | 0 | 0 | (100) | 0 |
| No reply.................................. | 5 | 5 | 20 |  | 0 | (60) | 20 | 0 |

## Footnotes for Table 16

a. "Apprentice" refers to the experiences (performance of duties) in laboratories which are not accredited as schools of cytotechnology where some of the cytotechnologists received their training. Some spent the second half of their 12 months training program in these laboratories to fulfill the certification requirements. Others received their training in these laboratories prior to the accreditation of schools of cytotechnology. "Present Job" refers to the experiences (performance of duties) on the jobs which the cytotechnologists presently hold. This table shows the N (number) and % (percent) of cytotechnologists who had the listed experiences in the apprentice laboratories and either are repeating them on their jobs or, if not, what other experiences they indicated.
For example: Of the 49 cytotechnologists who recorded appearance of all specimens during their apprentice
55% said they did so on their jobs,
37% said someone else did this,
2% gave a reply not included in the tabulating code,
6% did not reply for their job experience.
The largest percent for each duty (experience) response is placed in parentheses to facilitate location of trends in apprentice and job experience.

b. The summations of N (number) and % (percent) for Apprentice follow the vertical dimension of the table. All percents are based on 109 people who indicated apprentice experiences for their education programs. The remaining 140 of the 249 cytotechnologists did not indicate apprentice experience.

c. The summations of % (percent) for Present Job follow the horizontal dimension of the table. The percents are based on the N (number) in the corresponding parallel column (Apprentice). For example see footnote a.

d. X = Less than 1%.

## TABLE 17

## JOB AND APPRENTICE EXPERIENCES IN QUALITY CONTROL MEASURES

| Experiences | Present Job$^{a}$ |  | Apprentice$^{a}$ |  |  |  |  |  |
|---|---|---|---|---|---|---|---|---|
|  | Replies |  | Yes | Yes, other | No, not done | Someone else does | Other reply | No reply |
|  | N$^{b}$ | %$^{b}$ | %$^{c}$ | %$^{c}$ | %$^{c}$ | %$^{c}$ | %$^{c}$ | %$^{c}$ |
| Cytotechnologists with the following job experiences and related apprentice experiences.......... | 229 | 100 |  |  |  |  |  |  |
| 1. Identification & verification of specimens |  |  |  |  |  |  |  |  |
| a. Record appearance of all specimens on request/report forms immediately upon receipt in laboratory |  |  |  |  |  |  |  |  |
| Yes.................................... | 75 | 33 | (36) | 0 | 0 | 7 | 0 | 57 |
| Yes, other (non-genital).................... | 38 | 17 | 0 | (26) | 0 | 0 | 3 | 71 |
| No, not done.............................. | 34 | 15 | 0 | 6 | (53) | 0 | 0 | 41 |
| Someone else does this..................... | 61 | 27 | (30) | 5 | 2 | 12 | 0 | 52 |
| Other reply................................ | 9 | 4 | 11 | 11 | 0 | 0 | (33) | 44 |
| No reply.................................. | 12 | 5 | (17) | 8 | 0 | 0 | 0 | 75 |
| b. Use of serial accession numbers for verifying patients' and case numbers |  |  |  |  |  |  |  |  |
| Yes.................................... | 150 | 66 | (41) |  | x$^{d}$ | 2 | 0 | 56 |
| No, not done.............................. | 2 | x$^{d}$ | (100) |  | 0 | 0 | 0 | 0 |
| Someone else does this..................... | 66 | 29 | (38) |  | 0 | 11 | 0 | 52 |
| Other reply................................ | 4 | 2 | 25 |  | 0 | 0 | 25 | 50 |
| No reply.................................. | 7 | 3 | (29) |  | 0 | 0 | 0 | 71 |
| c. Record case number on equipment used to process non-genital cases |  |  |  |  |  |  |  |  |
| Yes.................................... | 135 | 59 | (39) |  | 0 | 4 | 0 | 58 |
| No, not done.............................. | 19 | 8 | 11 |  | (42) | 0 | 0 | 47 |
| Someone else does this..................... | 62 | 27 | (37) |  | 11 | 0 | 0 | 52 |
| Other reply................................ | 2 | x$^{d}$ | 0 |  | 0 | 0 | (50) | 50 |
| No reply.................................. | 11 | 5 | ( 9) |  | 0 | 0 | 0 | 91 |

TABLE 17
(continued)

| | Present Job$^a$ | | Apprentice$^a$ | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Replies | | Yes | Yes, other | No, not done | Someone else does | Other reply | No reply |
| | N$^b$ | %$^b$ | %$^c$ | %$^c$ | %$^c$ | %$^c$ | %$^c$ | %$^c$ |
| 1. d. Check, routinely, patients' names &/or accession numbers on micro slides with those on request/report forms before processing | | | | | | | | |
| Yes | 158 | 69 | (41) | | 0 | 3 | | 56 |
| No, not done | 6 | 3 | 0 | | (67) | 0 | | 33 |
| Someone else does this | 61 | 27 | (33) | | 0 | 16 | | 51 |
| No reply | 4 | 2 | 0 | | 0 | 0 | | 100 |
| e. Record, routinely, the number of slides & filtration units made from a specimen or case at the beginning of processing | | | | | | | | |
| Yes | 111 | 48 | (35) | | 2 | 5 | 0 | 59 |
| No, not done | 43 | 19 | 12 | | (30) | 0 | 0 | 58 |
| Someone else does this | 63 | 28 | (33) | | 2 | 13 | 0 | 52 |
| Other reply | 4 | 2 | 0 | | 0 | 0 | (75) | 25 |
| No reply | 8 | 3 | (25) | | 0 | 0 | 0 | 75 |
| Use this record to verify number of slides per case | | | | | | | | |
| Yes | 126 | 55 | (39) | | x$^d$ | 2 | | 58 |
| No, not done | 38 | 17 | 11 | | (32) | 0 | | 58 |
| Someone else does this | 44 | 19 | (30) | | 2 | 21 | | 48 |
| No reply | 21 | 9 | 9 | | 0 | 0 | | 91 |
| 2. Staining specimens | | | | | | | | |
| a. Regularly check shelf life of reagents & discard those that have expired | | | | | | | | |
| Yes | 136 | 59 | (37) | | 2 | 7 | 0 | 54 |
| No, not done | 19 | 8 | 0 | | (37) | 0 | 0 | 63 |
| Someone else does this | 69 | 30 | (26) | | 3 | 13 | 0 | 58 |
| Other reply | 1 | x$^d$ | 0 | | 0 | 0 | (100) | 0 |
| No reply | 4 | 2 | 0 | | 0 | 0 | 0 | 100 |

## TABLE 17
(continued)

| Experiences | Present Job[a] | | Apprentice[a] | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Replies | | Yes | Yes, other | No, not done | Someone else does | Other reply | No reply |
| | N[b] | %[b] | %[c] | %[c] | %[c] | %[c] | %[c] | %[c] |
| 2. b. Make stain & reagents used in the lab. | | | | | | | | |
| Yes | 39 | 17 | (36) | 10 | | 3 | 0 | 51 |
| Yes; other (purchase some/make some; purchase all; centrally prepared in institution) | 129 | 56 | 5 | (36) | | 2 | 0 | 58 |
| Someone else does this | 56 | 24 | 13 | (27) | | 7 | 0 | 54 |
| Other reply | 5 | 2 | 0 | (60) | | 0 | 0 | 40 |
| c. Regularly examines slides for quality of staining, such as definition of intranuclear structure & intensity of nuclear stain, etc. | | | | | | | | |
| Yes, (each staining batch or daily) | 165 | 72 | (43) | 2 | 0 | 2 | x[d] | 52 |
| Yes, other (weekly, change of stain, other) | 34 | 15 | 6 | (21) | 0 | 0 | 0 | 74 |
| No , not done | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Someone else does this | 21 | 9 | (24) | 10 | 0 | 0 | 0 | 67 |
| Other reply | 7 | 3 | 0 | 14 | 0 | 0 | (29) | 57 |
| No reply | 2 | x[d] | 0 | 50 | 0 | 0 | 0 | 50 |
| d. Filter stains prior to use | | | | | | | | |
| Yes, (each time slides stained, several times per day) | 27 | 12 | (37) | 7 | 0 | 4 | 0 | 52 |
| Yes, other (daily, weekly, other) | 123 | 54 | 2 | (37) | x[d] | 2 | 0 | 58 |
| No, not done | 1 | x[d] | 0 | 100 | 0 | 0 | 0 | 0 |
| Someone else does this | 73 | 32 | 7 | (29) | 0 | 10 | 1 | 53 |
| Other reply | 4 | 2 | 0 | 0 | 0 | 0 | (50) | 50 |
| No reply | 1 | x[d] | 0 | 0 | 0 | 0 | 0 | 100 |
| e. Filter alcohols for staining prior to use | | | | | | | | |
| Yes, (each time slides stained, several times per day) | 12 | 5 | (17) | 0 | 0 | 0 | 0 | 83 |
| Yes, other (daily, weekly, other) | 74 | 32 | 1 | (30) | 3 | 3 | 0 | 64 |
| No, not done | 68 | 30 | 0 | 4 | (44) | 3 | 0 | 49 |
| Someone else does this | 66 | 29 | 5 | (24) | 6 | 12 | 3 | 50 |
| Other reply | 7 | 3 | 0 | 0 | 0 | 0 | (43) | 57 |
| No reply | 2 | x[d] | 0 | 0 | 0 | 0 | 0 | 100 |

## TABLE 17
(continued)

| Experiences | Present Job[a] Replies | | Apprentice[a] | | | | | |
|---|---|---|---|---|---|---|---|---|
| | N[b] | %[b] | Yes %[c] | Yes, other %[c] | No, not done %[c] | Someone else does %[c] | Other reply %[c] | No reply %[c] |
| 2. f. Frequency of changing stains in staining dishes | | | | | | | | |
| Yes, (daily) | 6 | 3 | (17) | 0 | | 0 | | 83 |
| Yes, other (weekly, bi-weekly, monthly, as needed) | 146 | 64 | 1 | (38) | | 5 | | 55 |
| Someone else does this | 71 | 31 | 4 | (35) | | 9 | | 52 |
| No reply | 6 | 3 | 0 | 0 | | 0 | | 100 |
| g. Frequency of changing alcohol solutions used in staining | | | | | | | | |
| Yes, (daily) | 28 | 12 | (25) | 4 | | 0 | | 71 |
| Yes, other (weekly, bi-weekly, monthly, as needed) | 120 | 52 | 2 | (40) | | 5 | | 53 |
| Someone else does this | 75 | 33 | 15 | (28) | | 9 | | 48 |
| No reply | 6 | 3 | 0 | 0 | | 0 | | 100 |
| h. Separate staining of body cavity fluids (hypercellular specimens) | | | | | | | | |
| Yes | 81 | 35 | (30) | | 3 | 7 | 0 | 61 |
| No, not done | 67 | 29 | 5 | | (42) | 2 | 0 | 52 |
| Someone else does this | 65 | 28 | (28) | | 9 | 9 | 0 | 54 |
| Other reply | 3 | 1 | 0 | | 0 | 0 | (67) | 33 |
| No reply | 13 | 6 | 8 | | 8 | 8 | 0 | 77 |

---

a. "Present Job" refers to the experiences (performance of duties) on the jobs which the cytotechnologists presently hold. "Apprentice" refers to the experiences (performance of duties) in laboratories which are not accredited as schools of cytotechnology where some of the cytotechnologists received their training. Some spent the second half of their 12 months training program in these laboratories to fulfill the certification requirements. Others received their training in these laboratories prior to the accreditation of schools of cytotechnology. This table shows the N (number) and % (percent) of cytotechnologists who had the listed experiences in apprentice laboratories and either are repeating them on their jobs or, if not, what other experiences they indicated. The column for "No reply" under Apprentice contains a large percent in all instances because there were more people who indicated job experiences than apprentice experiences (299 versus 109).

## Footnotes for Table 17
(continued)

a. (continued)
For example: Of the 75 people who recorded appearance of all specimens on their jobs,
36% said they did as apprentices,
7% said someone else did this at the apprentice laboratory,
57% did not reply for their apprentice experience.
The largest percent (except "no reply") for each duty (experience) response is placed in parentheses to facilitate location of trends in job and apprentice experiences.

b. The summations of N (number) and % (percent) for Present Job follow the vertical dimension of the table. All percents are based on 229 people who indicated job experiences. The remaining 20 people did not indicate job experiences.

c. The summations of % (percent) for Apprentice follow the horizontal dimension of the table. The percents are based on the N (number) in the corresponding parallel column (Present Job). For example see Footnote a.

d. X = Less than 1%.

## TABLE 18

## TECHNICAL PROCEDURES PERFORMED IN EDUCATION, APPRENTICE AND JOB ACCORDING TO 1965 CERTIFICATION EXAMINATION PERFORMANCE

| Technical Procedures | Education[a] | | | | Apprentice[b] | | | | Education &/or Apprentice and Job[c] | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Total in Study | | Pass Exam[d] | Fail Exam[d] | Total in Study | | Pass Exam[d] | Fail Exam[d] | Total in Study | | Pass Exam[d] | Fail Exam[d] |
| | N[e] | %[e] | %[f] | %[f] | N[e] | %[e] | %[f] | %[f] | N[e] | %[e] | %[f] | %[f] |
| Technical procedures learned & performed by cytotechnologists as students & on the job.............................. | 218 | 100 | 91 | 9 | 113 | 100 | 96 | 4 | 221 | 100 | 94 | 6 |
| 1. Obtaining specimens | | | | | | | | | | | | |
| a. Female Genital | | | | | | | | | | | | |
| Vaginal aspiration............. | 53 | 24 | 79 | 21 | 13 | 12 | 92 | 8 | 20 | 9 | 65 | 35 |
| Vaginal irrigation............. | 18 | 8 | 67 | 33 | 4 | 4 | 75 | 25 | 5 | 2 | 20 | 80 |
| Pipette........................ | 28 | 13 | 79 | 21 | 8 | 7 | 88 | 12 | 13 | 6 | 62 | 38 |
| Cotton swab.................... | 38 | 17 | 82 | 18 | 12 | 11 | 92 | 8 | 12 | 5 | 67 | 33 |
| Cervical spatula............... | 50 | 23 | 82 | 18 | 12 | 11 | 92 | 8 | 19 | 9 | 63 | 37 |
| b. Non-genital | | | | | | | | | | | | |
| Gastric washes................. | 114 | 52 | 89 | 11 | 39 | 35 | 95 | 5 | 55 | 25 | 87 | 13 |
| Oral........................... | 95 | 44 | 93 | 7 | 44 | 39 | 93 | 7 | 60 | 27 | 92 | 8 |
| Aerosol induced respiratory.... | 47 | 22 | 89 | 11 | 19 | 17 | 95 | 5 | 22 | 10 | 86 | 14 |
| 2. Special cytopreparatory techniques | | | | | | | | | | | | |
| Centrifuging...................... | 196 | 90 | 91 | 9 | 100 | 88 | 96 | 4 | 160 | 72 | 92 | 8 |
| Cell filtration................... | 160 | 73 | 91 | 9 | 58 | 51 | 95 | 5 | 84 | 38 | 92 | 8 |
| Irrigation........................ | 35 | 33 | 91 | 9 | 10 | 9 | 80 | 20 | 17 | 8 | 82 | 18 |
| 3. Staining | | | | | | | | | | | | |
| Papanicolaou (or modification)..... | 213 | 98 | 90 | 10 | 106 | 94 | 96 | 4 | 180 | 81 | 91 | 9 |
| Hormonal........................... | 70 | 32 | 91 | 9 | 31 | 27 | 90 | 10 | 42 | 19 | 90 | 10 |
| Cytogenetic........................ | 63 | 29 | 94 | 6 | 37 | 33 | 92 | 8 | 43 | 19 | 93 | 7 |

## TABLE 18
(continued)

| Technical Procedures | Education[a] | | | | Apprentice[b] | | | | Education &/or Apprentice and Job[c] | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Total in Study | | Pass Exam[d] | Fail Exam[d] | Total in Study | | Pass Exam[d] | Fail Exam[d] | Total in Study | | Pass Exam[d] | Fail Exam[d] |
| | N[e] | %[e] | %[f] | %[f] | N[e] | %[e] | %[f] | %[f] | N[e] | %[e] | %[f] | %[f] |
| 4. Microscopic cytomorphology | | | | | | | | | | | | |
| a. Female Genital | | | | | | | | | | | | |
| Cervical Spatula | 190 | 87 | 91 | 9 | 101 | 89 | 96 | 4 | 191 | 86 | 92 | 8 |
| Vaginal | 203 | 93 | 91 | 9 | 106 | 94 | 96 | 4 | 201 | 91 | 92 | 8 |
| Endocervical | 196 | 90 | 90 | 10 | 102 | 90 | 96 | 4 | 194 | 88 | 91 | 9 |
| Endometrial | 187 | 86 | 90 | 10 | 97 | 86 | 96 | 4 | 179 | 81 | 91 | 9 |
| Irrigation | 106 | 49 | 91 | 9 | 48 | 42 | 94 | 6 | 83 | 38 | 90 | 10 |
| b. Respiratory | | | | | | | | | | | | |
| Sputum | 209 | 96 | 90 | 10 | 102 | 90 | 96 | 4 | 192 | 87 | 91 | 9 |
| Bronchial washings | 204 | 94 | 91 | 9 | 97 | 86 | 96 | 4 | 181 | 82 | 92 | 8 |
| c. Gastrointestinal tract | | | | | | | | | | | | |
| Esophageal | 195 | 89 | 90 | 10 | 83 | 73 | 95 | 5 | 151 | 68 | 92 | 8 |
| Gastric | 203 | 93 | 91 | 9 | 94 | 83 | 96 | 4 | 167 | 76 | 91 | 9 |
| Colon | 161 | 74 | 92 | 8 | 63 | 56 | 94 | 6 | 110 | 50 | 92 | 8 |
| d. Serous Fluids | | | | | | | | | | | | |
| Pleural | 209 | 96 | 90 | 10 | 96 | 85 | 97 | 3 | 183 | 83 | 91 | 9 |
| Ascitic | 206 | 94 | 91 | 9 | 92 | 81 | 96 | 4 | 178 | 81 | 91 | 9 |
| Pericardial | 171 | 78 | 91 | 9 | 66 | 58 | 94 | 6 | 133 | 60 | 90 | 10 |
| e. Urine | 206 | 94 | 91 | 9 | 96 | 85 | 96 | 4 | 181 | 82 | 91 | 9 |
| f. Breast | 206 | 94 | 91 | 9 | 103 | 91 | 96 | 4 | 194 | 88 | 92 | 8 |
| g. Oral | 186 | 85 | 91 | 9 | 91 | 81 | 96 | 4 | 159 | 72 | 93 | 7 |

## TABLE 18
(continued)

| Technical Procedures | Education[a] | | | | Apprentice[b] | | | | Education &/or Apprentice and Job[c] | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Total in Study | | Pass Exam[d] | Fail Exam[d] | Total in Study | | Pass Exam[d] | Fail Exam[d] | Total in Study | | Pass Exam[d] | Fail Exam[d] |
| | N[e] | %[e] | %[f] | %[f] | N[e] | %[e] | %[f] | %[f] | N[e] | %[e] | %[f] | %[f] |
| 5. Other microscopic evaluation | | | | | | | | | | | | |
| Hormonal........................... | 186 | 85 | 92 | 8 | 98 | 87 | 96 | 4 | 190 | 86 | 92 | 8 |
| Radiation or chemotherapy.......... | 187 | 86 | 93 | 7 | 87 | 77 | 95 | 5 | 172 | 78 | 92 | 8 |
| Viral.............................. | 93 | 43 | 95 | 5 | 44 | 39 | 93 | 7 | 91 | 41 | 97 | 3 |
| Cytogenetics....................... | 80 | 37 | 93 | 7 | 35 | 31 | 89 | 11 | 55 | 25 | 91 | 9 |
| Electron microscopy or other special microscopic techniques............ | 17 | 8 | 88 | 12 | 3 | 3 | 67 | 33 | 3 | 1 | 100 | 0 |
| Acridine Orange Fluorescence....... | 62 | 28 | 92 | 8 | 11 | 10 | 82 | 18 | 7 | 3 | 100 | 0 |

a. "Education" refers to performance of technical procedures in the school of cytotechnology.

b. "Apprentice" refers to the performance of technical procedures in laboratories which are not accredited as schools of cytotechnology where some of the cytotechnologists received their training. Some of them spent the second half of their 12 month training program in these laboratories to fulfill the certification requirements. Others received their training in these laboratories prior to the accreditation of schools of cytotechnology.

c. This refers to the technical procedures performed both in the training program (school of cytotechnology and/or apprentice) and on the job presently held by the cytotechnologists.

d. This refers to the examination given annually by the Board of Registry of Medical Technologists (ASCP) for certification of cytotechnologists. "Pass Exam" and "Fail Exam" refer to cytotechnologists who passed and failed the 1965 certification examination.

e. The summations of N (number) and % (percent) for each of the sections (Education, Apprentice, Education &/or Apprentice and Job) follow the vertical dimension of the table. The percents are based respectively on 218 cytotechnologists (Education), 113 cytotechnologists (Apprentice) and 221 cytotechnologists (Education &/or Apprentice and Job) who replied in this section.

f. The summations of % (percent) for each of the three sections (Education, Apprentice, Education &/or Apprentice and Job) follow the horizontal dimension of the table. The percents are based on the N (number) in the corresponding parallel column for each section. For example: 53 people said they obtained specimens by vaginal aspiration and of these
79% passed the 1965 certification examination and
21% failed.

# F. CHARACTERISTICS OF LABORATORY SUPERVISORS

Each cytotechnologost was asked to state the name and address of his immediate supervisor. Two quesionnaires 1/ were sent to the identified supervisors by the National Council on Medical Technology Education during July and August 1967. One requested information about the supervisor, himself, and the other was a form for evaluating the cytotechnologists' job performance. Although 158 job evaluation forms were returned, the supervisors' questionnaire was returned by 126 people. Eight people returned only the job evaluation forms. The information forms returned by 22 supervisors were incomplete or incorrectly completed. Nine supervisors each returned supervisor forms for themselves and job evaluation forms for two cytotechnologists. (Table 19 summarizes the replies)

Two-thirds of the 126 laboratory supervisors were physicians and almost all of the remaining were ASCP-certified cytotechnologists, some of whom had other types of certification.

Three-fourths of the laboratory supervisors were 36 years of age or older and two-thirds had more than five years of total experience. About three-fourths (71%) held two or fewer positions prior to their present one. Previous positions were supervisory in nature for about one-third (36%) of them and an additional one-fourth said they had held a variety of types of positions (non-supervisory, supervisory and research).

The positions currently held by almost three-fourths (71%) of them were in hospitals and by about one-fourth (22%) in independent laboratories. These positions were held in 37 states, the District of Columbia, Puerto Rico, and Canada. The position title for more than half (58%) of the supervisors was Laboratory Director and for one-third was Supervisor. About half (55%) of them indicated the department they supervised. These included 25% in Cytology, 8% in Pathology and 17% i all laboratory departments. The groups are equally divided in the length of time they have held their present positions; 43% for five years or less and 43% for six years or longer. Seventeen percent said that their present positions include teaching responsibilities.

The supervisors were asked for the number of personnel under their direction. Most of the supervisors indicated that they have ASCP-certified cytotechnologists and clerical personnel with the majority having one or two people of each category. Those indicating other categories gave the following in descending order of frequency: non-ASCP laboratory assistants and technologists, ASCP-certified medical technologists, maintenance personnel, "other" technical personnel, ASCP-certified histologic technicians, and laboratory assistants.

More than three-fourths (79%) of the laboratory supervisors attended college for four or more years and two-thirds had earned doctorate degrees in medicine. Formal education in cytotechnology was indicated by three-fourths of them including 46% who said they received it in a pathology residency and 28% in a school of cytotechnology.

Eighty-seven percent of the laboratory supervisors participated in continuing education. Academic credit was earned by 4%. Two-thirds attended non-credit earning workshops or seminars. Professional organization meetings were attended by 82% of them. Almost all (95%) of them belonged to professional organizations.

Between 78% and 80% used four or more professional journals and textbooks in their work.

According to the supervisors' estimates of work done in their laboratories, about two-thirds reported a maximum of 20,000 slides of female genital material (62%) and a maximum of 2,000 slides on non-genital material (67%).

It is difficult to identify any of these supervisor characteristics specifically with cytotechnologists who passed and failed the 1965 certification examination because the number (10) of respondents supervising failing cytotechnologists is too small to make such a comparison.

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1/ Both questionnaires are reproduced in the Appendix.

## TABLE 19

## CHARACTERISTICS OF LABORATORY SUPERVISORS

| Item | Total Group | | Passed Exam | Failed Exam |
|---|---|---|---|---|
| | N[a] | %[a] | %[b] | %[b] |
| Number and Percent of Laboratory Supervisors | 126 | 100 | 92 | 8 |
| 1. Certified as | | | | |
| M.D. | 83 | 66 | 88 | 12 |
| C.T.(ASCP) | 23 | 18 | 100 | 0 |
| Other[c] | 16 | 13 | 100 | 0 |
| None | 3 | 2 | 100 | 0 |
| No reply | 1 | X[t] | 100 | 0 |
| 2. Age | | | | |
| 24 through 35 years | 23 | 18 | 96 | 4 |
| 36 through 45 years | 54 | 43 | 91 | 9 |
| 46 through 55 years | 26 | 21 | 96 | 4 |
| 56 years or more[d] | 15 | 12 | 93 | 7 |
| No reply | 8 | 6 | 75 | 25 |
| 3. Total length of experience | | | | |
| 1 through 5 years | 21 | 17 | 81 | 19 |
| 6 through 10 years | 40 | 32 | 100 | 0 |
| 11 years or more[e] | 45 | 36 | 89 | 11 |
| No reply | 20 | 16 | 95 | 5 |
| 4. Positions held prior to present position | | | | |
| a. Number | | | | |
| 0 positions | 24 | 19 | 92 | 8 |
| 1 position | 39 | 31 | 92 | 8 |
| 2 positions | 27 | 21 | 93 | 7 |
| 3 positions or more[f] | 25 | 20 | 88 | 12 |
| No reply | 11 | 9 | 100 | 0 |
| b. Type | | | | |
| Non-supervisory | 13 | 10 | 100 | 0 |
| Supervisory | 45 | 36 | 82 | 18 |
| Research | 4 | 3 | 100 | 0 |
| More than one type | 30 | 24 | 100 | 0 |
| None | 2 | 2 | 100 | 0 |
| No reply | 32 | 25 | 94 | 6 |
| 5. Present position | | | | |
| a. Type of laboratory | | | | |
| Hospital | 89 | 71 | 92 | 8 |
| Independent | 28 | 22 | 93 | 7 |
| Other[g] | 8 | 6 | 88 | 12 |
| No reply | 1 | X[t] | 100 | 0 |

## TABLE 19
(continued)

| Item | Total Group | | Passed Exam | Failed Exam |
|---|---|---|---|---|
| | N[a] | %[a] | %[b] | %[b] |
| 5. b. Location | | | | |
| Arizona | 2 | 2 | 50 | 50 |
| California | 15 | 12 | 93 | 7 |
| District of Columbia | 1 | X[t] | 0 | 100 |
| Illinois | 7 | 6 | 86 | 14 |
| Louisiana | 6 | 5 | 100 | 0 |
| Maryland | 6 | 5 | 100 | 0 |
| New Jersey | 5 | 4 | 80 | 20 |
| North Carolina | 6 | 5 | 100 | 0 |
| Pennsylvania | 4 | 3 | 75 | 25 |
| South Carolina | 4 | 3 | 75 | 25 |
| Texas | 5 | 4 | 80 | 20 |
| Virginia | 5 | 4 | 80 | 20 |
| Wisconsin | 1 | X[t] | 0 | 0 |
| Other[h] | 59 | 47 | 100 | 0 |
| c. Title | | | | |
| Director of laboratory | 73 | 58 | 88 | 12 |
| Supervisor | 40 | 32 | 100 | 0 |
| Other[i] | 11 | 9 | 100 | 0 |
| No reply | 2 | 2 | 50 | 50 |
| d. Department in which supervising | | | | |
| Pathology | 10 | 8 | 80 | 20 |
| Cytology | 31 | 25 | 97 | 3 |
| All laboratory departments | 21 | 17 | 100 | 0 |
| Other[j] | 7 | 6 | 100 | 0 |
| No reply | 57 | 45 | 88 | 12 |
| e. Length of time in present position | | | | |
| Less than 1 year through 5 years | 54 | 43 | 91 | 9 |
| 6 through 10 years | 32 | 25 | 94 | 6 |
| 11 years or more[k] | 23 | 18 | 91 | 9 |
| No reply | 17 | 13 | 100 | 0 |
| f. Teaching duties | | | | |
| Yes | 22 | 17 | 100 | 0 |
| No | 104 | 83 | 90 | 10 |
| 6. Number of personnel supervised | | | | |
| a. C.T.(ASCP) | | | | |
| 0 people | 16 | 13 | 88 | 12 |
| 1 person | 34 | 27 | 91 | 9 |
| 2 people | 36 | 29 | 89 | 11 |
| 3 people | 14 | 11 | 100 | 0 |
| 4 people or more[l] | 26 | 21 | 96 | 4 |
| b. M.T.(ASCP) | | | | |
| 0 people | 70 | 56 | 96 | 4 |
| 1 person | 7 | 6 | 57 | 43 |
| 2 people | 3 | 2 | 100 | 0 |
| 3 people | 3 | 2 | 100 | 0 |
| 4 people or more[l] | 43 | 34 | 91 | 9 |

## TABLE 19
(continued)

| Item | Total in Group | | Passed Exam | Failed Exam |
|---|---|---|---|---|
| | N[a] | %[a] | %[b] | %[b] |
| 6. c. H.T. (ASCP) | | | | |
| 0 people | 100 | 79 | 94 | 6 |
| 1 person | 14 | 11 | 79 | 21 |
| 2 people | 7 | 6 | 86 | 14 |
| 3 people | 3 | 2 | 100 | 0 |
| 4 people or more[1] | 2 | 2 | 100 | 0 |
| d. C.L.A. (ASCP) | | | | |
| 0 people | 110 | 87 | 92 | 8 |
| 1 person | 6 | 5 | 83 | 17 |
| 2 people | 3 | 2 | 100 | 0 |
| 3 people | 2 | 2 | 100 | 0 |
| 4 people or more[1] | 5 | 4 | 100 | 0 |
| e. Other technologists | | | | |
| 0 people | 59 | 47 | 97 | 3 |
| 1 person | 19 | 15 | 95 | 5 |
| 2 people | 8 | 6 | 75 | 25 |
| 3 people | 6 | 5 | 83 | 17 |
| 4 people or more[1] | 34 | 27 | 88 | 12 |
| f. Other laboratory assistants | | | | |
| 0 people | 55 | 44 | 93 | 7 |
| 1 person | 19 | 15 | 90 | 10 |
| 2 people | 24 | 19 | 96 | 4 |
| 3 people | 5 | 4 | 80 | 20 |
| 4 people or more[1] | 23 | 18 | 91 | 9 |
| g. Other technical personnel | | | | |
| 0 people | 92 | 73 | 91 | 9 |
| 1 person | 2 | 2 | 100 | 0 |
| 2 people | 8 | 6 | 88 | 12 |
| 3 people | 2 | 2 | 100 | 0 |
| 4 people or more[1] | 22 | 17 | 96 | 4 |
| h. Clerical personnel | | | | |
| 0 people | 28 | 22 | 93 | 7 |
| 1 person | 25 | 20 | 88 | 12 |
| 2 people | 19 | 15 | 95 | 5 |
| 3 people | 16 | 13 | 94 | 6 |
| 4 people or more[1] | 38 | 30 | 92 | 8 |
| i. Maintenance personnel | | | | |
| 0 people | 73 | 58 | 96 | 4 |
| 1 person | 32 | 25 | 84 | 16 |
| 2 people | 11 | 9 | 91 | 9 |
| 3 people | 7 | 6 | 86 | 14 |
| 4 people or more[1] | 3 | 2 | 100 | 0 |

TABLE 19
(continued)

| Item | Total in Group | | Passed Exam | Failed Exam |
|---|---|---|---|---|
| | N[a] | %[a] | %[b] | %[b] |
| 7. Education Background | | | | |
| a. Attended college | | | | |
| 0 years | 5 | 4 | 100 | 0 |
| 1 year | 3 | 2 | 100 | 0 |
| 2 years | 8 | 6 | 100 | 0 |
| 3 years | 7 | 6 | 100 | 0 |
| 4 years | 28 | 22 | 96 | 4 |
| 5 years or more[m] | 72 | 57 | 88 | 12 |
| No reply | 3 | 2 | 100 | 0 |
| b. College degree | | | | |
| None | 9 | 7 | 100 | 0 |
| Associate | 5 | 4 | 100 | 0 |
| Bachelor's | 16 | 13 | 94 | 6 |
| Master's | 4 | 3 | 100 | 0 |
| Doctorate | 82 | 65 | 90 | 10 |
| Other[n] | 4 | 3 | 75 | 25 |
| No reply | 6 | 5 | 100 | 0 |
| c. Major field of study | | | | |
| Medicine | 83 | 66 | 90 | 10 |
| Biological sciences | 24 | 19 | 100 | 0 |
| Other[o] | 9 | 7 | 100 | 0 |
| No reply | 10 | 8 | 80 | 20 |
| d. Formal education in cytotechnology | | | | |
| Yes, school of cytotechnology | 35 | 28 | 97 | 3 |
| Yes, pathology residency | 58 | 46 | 86 | 14 |
| Yes, other[p] | 4 | 3 | 100 | 0 |
| No | 24 | 19 | 96 | 4 |
| No reply | 5 | 4 | 100 | 0 |
| e. Attendance at school of cytotechnology | | | | |
| 6 months | 16 | 13 | 100 | 0 |
| 12 months | 8 | 6 | 100 | 0 |
| Other[q] | 44 | 35 | 86 | 14 |
| Did not attend | 12 | 10 | 100 | 0 |
| No reply | 46 | 37 | 91 | 9 |
| 8. Continuing education | | | | |
| a. Academic credit | 5 | 4 | 100 | 0 |
| Bachelor's degree | 3 | 2 | 100 | 0 |
| Master's degree | 1 | X[t] | 100 | 0 |
| Doctorate | 1 | X[t] | 100 | 0 |
| No reply | 121 | 96 | 92 | 8 |

## TABLE 19
(continued)

| Item | Total in Group | | Passed Exam | Failed Exam |
|---|---|---|---|---|
| | N[a] | %[a] | %[b] | %[b] |
| 8. b. Non-credit earning (workshops/ seminars) | 84 | 67 | 95 | 5 |
| Attended 1 | 51 | 41 | 92 | 8 |
| 2 | 21 | 17 | 91 | 9 |
| 3 or more[r] | 12 | 2 | 100 | 0 |
| No reply | 42 | 33 | 91 | 9 |
| c. Organizational meetings | 103 | 82 | 91 | 9 |
| Attended 1 | 45 | 36 | 93 | 7 |
| 2 | 37 | 29 | 92 | 8 |
| 3 or more[r] | 21 | 17 | 86 | 14 |
| No reply | 23 | 18 | 96 | 4 |
| d. Other types | | | | |
| Stated | 23 | 18 | 96 | 4 |
| No reply | 103 | 82 | 91 | 9 |
| 9. Membership in organizations | | | | |
| 1 organization | 20 | 16 | 90 | 10 |
| 2 organizations | 39 | 31 | 95 | 5 |
| 3 organizations | 30 | 24 | 93 | 7 |
| 4 organizations or more[r] | 31 | 25 | 87 | 13 |
| No reply | 6 | 5 | 100 | 0 |
| 10. Number of professional journals read | | | | |
| 1 through 3 named | 24 | 19 | 92 | 8 |
| 4 through 6 named | 45 | 36 | 91 | 9 |
| 7 or more named[r] | 55 | 44 | 93 | 7 |
| No reply | 2 | 2 | 100 | 0 |
| 11. Number of textbooks read | | | | |
| 1 through 3 named | 17 | 13 | 94 | 6 |
| 4 through 6 named | 31 | 25 | 94 | 6 |
| 7 or more named[r] | 67 | 53 | 100 | 0 |
| No reply | 11 | 9 | 36 | 64 |
| 12. Number of cases and slides examined in laboratory in 1966 | | | | |
| a. Female genital | | | | |
| 1) Cases: 10,000 or less | 67 | 53 | 90 | 10 |
| 10,001 through 20,000 | 30 | 24 | 93 | 7 |
| 20,001 or more[s] | 29 | 23 | 97 | 3 |
| 2) Slides: 10,000 or less | 50 | 40 | 88 | 12 |
| 10,001 through 20,000 | 28 | 22 | 93 | 7 |
| 20,001 or more[s] | 48 | 38 | 96 | 4 |
| b. Non-genital | | | | |
| 1) Cases: 1,000 or less | 88 | 70 | 90 | 10 |
| 1,001 through 2,000 | 20 | 16 | 100 | 0 |
| 2,001 or more[s] | 18 | 14 | 94 | 6 |
| 2) Slides: 1,000 or less | 57 | 45 | 88 | 12 |
| 1,001 through 2,000 | 28 | 22 | 96 | 4 |
| 2,001 or more[s] | 41 | 33 | 95 | 5 |

## Footnotes for Table 19

a. The summations of N (number) and % (percent) for the Total group follow the vertical dimension ot the table. All percents are based on 126 people.

b. The summations of % (percent) for Passed Exam and Failed Exam groups follow the horizontal dimension of the table. All percents are based on the N (number) in the corresponding parallel column. For example: In the Total group, 83 people are M.D.'s of whom 88% supervised people who passed the 1965 certification examination and 12% supervised people who failed.

c. "Other" includes supervisors who were certified as MT(ASCP), CT; HT(ASCP), CT; RN and CT; MT and MD; RT (Canada); MT(AMT); CT and advanced registered technologist in cytology (Canada).

d. The maximum age for Total and Passed Exam groups is 80 years, for Failed Exam group is 62 years.

e. The maximum total experience for Total and Passed Exam groups is 22 years, for Failed Exam group is 20 years.

f. The maximum number of previous positions for Total and Passed Exam groups is 10, for Failed Exam group is 7.

g. "Other" includes public health, clinic, combination of hospital and independent laboratories.

h. For Total group, "other" includes 25 states, Puerto Rico, and Canada. For Passed Exam group, "other" includes 23 states, Puerto Rico, and Canada. Each of these has less than 5% of the people.

i. "Other" includes titles of Professor, Instructor, Commanding Officer, Assistant Professor of Pathology.

j. "Other" includes Tissue Culture Laboratory and Obstetrics-Gynocology, Cytopathology, School of Cytotechnology, Cytology and Hematology, Oral Cytology, and Oral Pathology.

k. The maximum years of experience in present positions for Total and Passed Exam groups is 36, for Failed Exam group is 20 years.

l. The largest number of

| | | |
|---|---|---|
| CT(ASCP) | 14 | Total and Passed Exam groups |
| | 4 | Failed Exam group |
| MT(ASCP) | 27 | Total and Passed Exam groups |
| | 24 | Failed Exam group |
| HT(ASCP) | 9 | Total and Passed Exam groups |
| | 2 | Failed Exam group |
| CLA(ASCP) | 28 | Total and Passed Exam groups |
| | 1 | Failed Exam group |
| Other technologists | 27 | Total and Passed Exam group |
| | 9 | Failed Exam group |
| Other Lab. Ass'ts | 66 | Total and Failed Exam groups |
| | 13 | Passed Exam group |
| Other Tech. Personnel | 36 | Total and Failed Exam groups (one reply gave 126 enlisted men) |
| | 33 | Passed Exam group |
| Clerical | 15 | Total and Failed Exam groups |
| | 10 | Passed Exam group |
| Maintenance | 10 | Total and Passed Exam groups |
| | 3 | Failed Exam group |

m. The maximum number of years of college attendance for the Total and Passed Exam groups is 13, for the Failed Exam group is 6.

n. "Other" includes certificate programs indicated by replies of "School of Medical Technology", "Science", and "Nursing Education".

## Footnotes for Table 19
(continued)

o. "Other" includes replies of "Arts", "Humanities", "Law", "Teaching", "Home Economics".

p. "Other" includes replies indicating study at Papanicoloau School of Cytotechnology for less than 6 months, Ruth Graham at Roswell Park (New York), and study under pathologist.

q. "Other" includes the following replies:
"Have assisted running a cytotechnology school"
"University of Tennessee before approval and Boston under Ruth Graham"
"36 months"
"Special courses for pathologists"

r. Maximum number not tallied.

s. The maximum estimated number of cases and slides is as follows:

| | | |
|---|---|---|
| Female Genital cases | 59,000 | Total and Passed Exam groups |
| | 31,000 | Failed Exam group |
| Female Genital slides | 110,000 | Total and Passed Exam groups |
| | 40,000 | Failed Exam group |
| Non-genital cases | 11,000 | Total, Passed Exam and Failed Exam groups |
| Non-genital slides | 40,000 | Total and Passed Exam groups |
| | 32,000 | Failed Exam group |

The minimum estimated number of cases and slides is as follows:

| | | |
|---|---|---|
| Female Genital cases | 2,000 | Total and Failed Exam groups |
| | 300 | Passed Exam group |
| Female Genital slides | 3,000 | Total and Failed Exam groups |
| | 500 | Passed Exam group |
| Non-genital cases | 10 | Total and Passed Exam groups |
| | 50 | Failed Exam group |
| Non-genital slides | 300 | Total and Failed Exam groups |
| | 50 | Passed Exam group |

t. X = Less than 1%.

## G. JOB PERFORMANCE RATINGS

The second questionnaire returned by 158 laboratory supervisors contained 60 items describing aspects of cytotechnologists' job performance. These items were divided into five categories: Skills, Dependability, Reliability, Initiative and Personal Relations. The supervisors were asked to rate the particular cytotechnologist in this study population who was in their employ using the subjective scale of "excellent", "good", "average", "less than average", "unsatisfactory", and "does not apply". The last was to be used for items which may not apply to the duties performed by the cytotechnologist. Table 20 contains the distribution of ratings for 158 cytotechnologists, Table 21 for 141 who passed the 1965 certification examination, and Table 22 for 17 cytotechnologists who failed this examination.

The arithmetic mean of the number of people rated in each scale in all categories is as follows: 55% (87) of the 158 cytotechnologists were rated "excellent", 26% (41) rated "good", 10% (15) rated "average", 2% (2) rated "less than average", less than 1% (0.06) rated "unsatisfactory", and 6% (10) rated "does not apply".

There is a statistically significant difference in the distribution of ratings of the 158 cytotechnologists in seven of the job performance items. Significantly fewer of the cytotechnologists were rated "excellent" in the following items:

Judgment

| | |
|---|---|
| Skills n. | "Can logically relate cytomorphologic findings to patient history or provisional clinical diagnosis. (0.02 probability level) |

Continuing Education

| | |
|---|---|
| Initiative e. | "Reads publications pertaining to work. (Evident by conversation about publications and/or interest in introducing newly reported methods, hints for improving techniques, etc.)" (0.001 probability level) |
| Initiative g. | "Shows desire to continue education by attending local, regional and/or national educational meetings within the past 18 months." (0.10 probability level) |
| Initiative i. | "Reports, formally or informally, on attendance at educational meetings for the benefit of other members of the staff". (0.05 probability level) |

Personal Relations

| | |
|---|---|
| Initiative j. | "Constructively suggests modifications of administrative policies if occasion arises." (0.01 probability level) |

Significantly more of the cytotechnologists were rated "excellent" in

Techniques

| | |
|---|---|
| Reliability i. | "Legibly labels all equipment and slides used in processing a case." (0.10 probability level) |

Work Accomplishment

| | |
|---|---|
| Initiative c. | "Voluntarily does and reports additional laboratory work to prove or enhance findings when circumstances warrant. (Such as special processing, staining, etc.)" (0.10 probability level) |

There is a statistically significant difference in the distributions when comparing the arithmetic mean of the number of people rated in each scale in each category with individual items within that category. Significantly fewer of the 158 cytotechnologists were rated "excellent" in the comparison of the mean for

| | |
|---|---|
| Skills with Skills item n. | "Can logically relate cytomorphologic findings to patient history or provisional diagnosis." (Judgment) (0.05 probability level) |
| Reliability with Reliability item c. | "Demonstrates use of good judgment by obtaining and analyzing facts and applying them to situations to reach logical decisions in technical and non-technical situations." (Judgment) (0.05 probability level) |
| Initiative with Initiative item e. | "Reads publications pertaining to work. Evident by conversation about publications and/or interest in introducing newly reported methods, hints for improving techniques, etc.)" (Continuing Education) (0.05 probability level) |

There is no statistically significant difference in job performance rating between those who passed and those who failed the 1965 certification examination when comparing the arithmetic mean of the numbers of people rated in each scale in all categories of the pass group with the fail group.

There is, however, a statistically significant difference in the distribution of ratings of those who passed and failed the certification examinatin in seven job performance items. Significantly more of those who passed were rated "excellent" in the following items:

| | |
|---|---|
| Attendance | |
| Dependability item c. | "Amount of sick leave taken has been minimal and/or justified." (0.05 probability level) |
| Dependability item d. | "Requests for annual leave (vacation) have been reasonable (within established policy) and considerate of the total staff." (0.10 probability level) |
| Consults supervisor | |
| Dependability item j. | "Consults supervisor about unusual problems and/or situations (technical and/or administrative) when necessary." (0.05 probability level) |
| Quality Control | |
| Reliability item l. | "Takes appropriate precautions to maintain high quality of staining solutions (such as regularly filtering and changing stain,alcohol solutions and water)." (0.10 probability level) |
| Judgment | |
| Reliability item c. | "Demonstrates use of good judgment by obtaining and analyzing facts and applying them to situations to reach logical decisions in technical and non-technical situations." (0.10 probability level) |
| Appearance | |
| Personal Relations item e. | "Personal appearance is exemplary: clean uniform and shoes, personally neat, etc." (0.10 probability level) |
| Temperament | |
| Personal Relations item f. | "Has disposition (temperament) suited to the repetitive, sedentary nature of most of the work in cytotechnology." (0.05 probability level) |

## TABLE 20

## JOB PERFORMANCE RATINGS FOR 158 CYTOTECHNOLOGISTS WHO TOOK 1965 CERTIFICATION EXAMINATION

| Item | Total of 158 C.T. | Job Performance Rating | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Excellent | Good | Average | Less than Average | Unsatisfactory | Does not Apply | No Reply |
| PERCENT[a] rated for 60 Items...................... | % 100 | % 55 | % 26 | % 10 | % 2 | % X[e] | % 6 | % 1 |
| Skills: 15 Items................ | 100 | 55 | 30 | 8 | X[e] | X[e] | 5 | 6 |
| Each item[b] of | | | | | | | | |
| a. Techniques......... | 100 | 56 | 23 | 5 | 0 | 0 | 16 | X[e] |
| b. Techniques......... | 100 | 40 | 18 | 11 | 1 | 0 | 27 | 2 |
| d. Techniques......... | 100 | 65 | 27 | 2 | X[e] | 0 | 6 | 0 |
| e. Techniques......... | 100 | 63 | 27 | 9 | 0 | X[e] | X[e] | 0 |
| g. Techniques......... | 100 | 58 | 32 | 6 | 0 | 0 | 3 | 1 |
| h. Techniques......... | 100 | 67 | 29 | 4 | 0 | 0 | 0 | 0 |
| i. Techniques......... | 100 | 61 | 31 | 7 | X[e] | 0 | X[e] | 0 |
| c. Instrumentation.... | 100 | 51 | 25 | 8 | X[e] | 0 | 15 | 0 |
| f. Instrumentation.... | 100 | 55 | 33 | 11 | X[e] | 0 | 0 | X[e] |
| j. Judgment........... | 100 | 63 | 28 | 7 | 1 | 0 | X[e] | 0 |
| k. Judgment........... | 100 | 51 | 35 | 12 | X[e] | 0 | X[e] | 0 |
| l. Judgment........... | 100 | 51 | 36 | 11 | X[e] | X[e] | X[e] | 0 |
| m. Judgment........... | 100 | 48 | 36 | 10 | 3 | X[e] | 3 | X[e] |
| n. Judgment........... | 100 | 42[c,d] | 39 | 13 | 2 | 0 | 4 | X[e] |
| o. Efficiency......... | 100 | 58 | 30 | 9 | 1 | X[e] | 0 | 1 |
| Dependability: 11 Items......... | 100 | 64 | 23 | 8 | 1 | X[e] | 1 | 3 |
| Each item[b] of | | | | | | | | |
| a. Utilization of time | 100 | 61 | 26 | 9 | 3 | 0 | 1 | X[e] |
| h. Utilization of time | 100 | 69 | 25 | 4 | 0 | 0 | 1 | X[e] |
| i. Utilization of time | 100 | 68 | 23 | 5 | 3 | X[e] | 0 | 0 |
| k. Utilization of time | 100 | 61 | 27 | 10 | X[e] | 0 | 0 | 1 |
| b. Attendance.......... | 100 | 53 | 21 | 12 | 3 | X[e] | 10 | 1 |
| c. Attendance.......... | 100 | 65 | 20 | 13 | 1 | 0 | X[e] | X[e] |
| d. Attendance.......... | 100 | 67 | 20 | 9 | 3 | 0 | 1 | 1 |
| e. Attendance.......... | 100 | 57 | 32 | 6 | 3 | 0 | 1 | 1 |
| f. Attendance.......... | 100 | 69 | 22 | 7 | 2 | 0 | X[e] | 0 |
| g. Attendance.......... | 100 | 67 | 23 | 8 | 1 | 0 | X[e] | X[e] |
| j. Consults Supervisor | 100 | 70 | 22 | 7 | X[e] | X[e] | 0 | X[e] |

TABLE 20
(continued)

| Item | Total of 158 C.T. | Job Performance Rating | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Excellent | Good | Average | Less than Average | Unsatisfactory | Does not Apply | No Reply |
| PERCENT[a] rated for each category (continued) | % | % | % | % | % | % | % | % |
| Reliability: 12 Items.......... | 100 | 56 | 23 | 7 | $X^e$ | $X^e$ | 10 | 13 |
| Each item[b] of | | | | | | | | |
| a. Techniques......... | 100 | 70 | 25 | 3 | $X^e$ | 0 | 2 | 0 |
| b. Techniques......... | 100 | 67 | 22 | 7 | 2 | $X^e$ | 0 | 1 |
| g. Techniques......... | 100 | 41 | 21 | 14 | 1 | 0 | 22 | 1 |
| h. Techniques......... | 100 | 51 | 17 | 5 | 0 | 0 | 26 | $X^e$ |
| i. Techniques......... | 100 | 59[c] | 14 | 6 | 0 | 0 | 21 | $X^e$ |
| j. Techniques......... | 100 | 62 | 19 | 5 | 0 | 0 | 12 | 2 |
| c. Judgment........... | 100 | 48[d] | 38 | 10 | 3 | 0 | 1 | $X^e$ |
| d. Judgment........... | 100 | 69 | 25 | 6 | $X^e$ | 0 | 0 | 0 |
| e. Judgment........... | 100 | 59 | 23 | 10 | 3 | 0 | 4 | 1 |
| f. Judgment........... | 100 | 48 | 24 | 11 | 3 | 0 | 13 | $X^e$ |
| k. Quality Control.... | 100 | 53 | 32 | 8 | 1 | 0 | 5 | $X^e$ |
| l. Quality Control.... | 100 | 49 | 25 | 6 | 1 | 0 | 17 | 1 |
| Initiative: 16 Items........... | 100 | 46 | 26 | 12 | 3 | $X^e$ | 10 | 13 |
| Each item[b] of | | | | | | | | |
| a. Work Accomplishment | 100 | 51 | 27 | 15 | 4 | 1 | 3 | $X^e$ |
| c. Work Accomplishment | 100 | 41[c] | 29 | 16 | 3 | $X^e$ | 10 | 1 |
| d. Work Accomplishment | 100 | 56 | 29 | 11 | $X^e$ | 0 | 3 | $X^e$ |
| f. Work Accomplishment | 100 | 53 | 30 | 12 | 2 | 1 | 0 | 1 |
| l. Work Accomplishment | 100 | 41 | 18 | 6 | 0 | 0 | 32 | 3 |
| m. Work Accomplishment | 100 | 50 | 25 | 13 | $X^e$ | $X^e$ | 10 | $X^e$ |
| n. Work Accomplishment | 100 | 51 | 29 | 13 | 2 | 0 | 4 | 2 |
| o. Work Accomplishment | 100 | 49 | 30 | 9 | 4 | $X^e$ | 8 | $X^e$ |
| b. Personal Relations | 100 | 54 | 29 | 8 | 3 | $X^e$ | 5 | $X^e$ |
| j. Personal Relations | 100 | 36[c] | 34 | 14 | 4 | $X^e$ | 10 | 2 |
| e. Continuing Education | 100 | 37[c,d] | 34 | 21 | 6 | 1 | $X^e$ | $X^e$ |
| g. Continuing Education | 100 | 48[c] | 22[c] | 18 | 3 | 3 | 4 | 3 |
| h. Continuing Education | 100 | 42 | 17 | 13 | 3 | 2 | 20 | 3 |
| i. Continuing Education | 100 | 33[c] | 25 | 14 | 3 | 1 | 22 | 3 |
| k. Teaching........... | 100 | 39 | 17 | 4 | 2 | 0 | 35 | 3 |
| p. Judgment........... | 100 | 54 | 29 | 14 | 2 | $X^e$ | 0 | $X^e$ |

## TABLE 20
(continued)

| Item | Total of 158 C.T. | Job Performance Rating | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Excellent | Good | Average | Less than Average | Unsatisfac-tory | Does not Apply | No Reply |
| PERCENT[a] rated for each category (continued) | % | % | % | % | % | % | % | % |
| Personal Relations: 6 Items.... | 100 | 59 | 25 | 9 | 3 | X[e] | 1 | 4 |
| Each item[b] of | | | | | | | | |
| a. Peers.................. | 100 | 56 | 29 | 11 | 3 | X[e] | 0 | X[e] |
| b. Peers.................. | 100 | 60 | 27 | 8 | 4 | 0 | 0 | 1 |
| c. Supervision............ | 100 | 56 | 29 | 10 | 4 | 1 | X[e] | X[e] |
| d. Lab. Assistant......... | 100 | 54 | 23 | 10 | 3 | X[e] | 7 | 1 |
| e. Appearance............. | 100 | 72 | 17 | 10 | X[e] | 0 | 0 | X[e] |
| f. Temperament............ | 100 | 63 | 27 | 6 | 2 | X[e] | 0 | 2 |

---

a. The "Total" is entered as 100% to indicate the horizontal direction of summation in this table. The actual sum of percents varies from 98 through 101% because all are adjusted to the nearest whole number.

b. Letters preceding titles identify items in the rating form completed by the Supervisor. The complete list of items is in the Appendix.

c. Comparison of item rating distribution for 158 cytotechnologists with means for all items for 158 cytotechnologists. Calculations of chi square distribution (Kolmogorov-Smirnov formula) shows that these figures are statistically significant because the frequency of replies exceeds the indicated probability level.

1) Skills n: $X^2 = 7.93$; df = 2, $X^2 = 7.82$ (0.02 probability level)
2) Reliability i: $X^2 = 5.87$; df = 2, $X^2 = 4.61$ (0.10 probability level)
3) Initiative c: $X^2 = 5.89$; df = 2, $X^2 = 4.61$ (0.10 probability level)
4) Initiative e: $X^2 = 14.87$; df = 2, $X^2 = 13.82$ (0.001 probability level)
5) Initiative g: $X^2 = 5.67$; df = 2, $X^2 = 4.61$ (0.10 probability level)
6) Initiative i: $X^2 = 7.37$; df = 2, $X^2 = 5.99$ (0.05 probability level)
7) Initiative j: $X^2 = 10.32$; df = 2, $X^2 = 9.22$ (0.01 probability level)

d. Comparison of item rating distribution for 158 cytotechnologists with means for items in each section for 158 cytotechnologists. Calculations of chi square distribution (Kolmogorov-Smirnov formula) shows that these figures are statistically significant because the frequency of replies exceeds the indicated probability level.

1) Skills n: $X^2 = 6.79$; df = 2, $X^2 = 5.99$ (0.05 probability level)
2) Reliability c: $X^2 = 7.30$; df = 2, $X^2 = 5.99$ (0.05 probability level)
3) Initiative e: $X^2 = 6.33$; df = 2, $X^2 = 5.99$ (0.05 probability level)

e. X = Less than 1%.

## TABLE 21

## JOB PERFORMANCE RATINGS FOR 141 CYTOTECHNOLOGISTS WHO PASSED THE 1965 CERTIFICATION EXAMINATION

| Item | Total of 141 C.T. | Job Performance Rating | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Excellent | Good | Average | Less than Average | Unsatisfactory | Does not Apply | No Reply |
| | % | % | % | % | % | % | % | % |
| PERCENT[a] rated for 60 Items.................... | 100 | 57 | 25 | 9 | 1 | X[d] | 6 | 2 |
| Skills: 15 Items.............. | 100 | 57 | 29 | 8 | X[d] | X[d] | 6 | X[d] |
| Each item[b] of | | | | | | | | |
| a. Techniques......... | 100 | 56 | 23 | 4 | 0 | 0 | 16 | X[d] |
| b. Techniques......... | 100 | 39 | 18 | 12 | X[d] | 0 | 28 | 2 |
| d. Techniques......... | 100 | 67 | 23 | 2 | X[d] | 0 | 7 | 0 |
| e. Techniques......... | 100 | 65 | 25 | 9 | 0 | X[d] | X[d] | 0 |
| g. Techniques......... | 100 | 60 | 31 | 5 | 0 | 0 | 4 | 1 |
| h. Techniques......... | 100 | 69 | 27 | 4 | 0 | 0 | 0 | 0 |
| i. Techniques......... | 100 | 62 | 31 | 6 | X[d] | 0 | X[d] | 0 |
| c. Instrumentation.... | 100 | 53 | 23 | 8 | X[d] | 0 | 16 | 0 |
| f. Instrumentation.... | 100 | 56 | 33 | 10 | X[d] | 0 | 0 | X[d] |
| j. Judgment........... | 100 | 66 | 26 | 6 | 1 | 0 | 0 | 0 |
| k. Judgment........... | 100 | 53 | 36 | 10 | X[d] | 0 | X[d] | 0 |
| l. Judgment........... | 100 | 53 | 36 | 9 | X[d] | X[d] | X[d] | 0 |
| m. Judgment........... | 100 | 49 | 36 | 9 | 1 | X[d] | 3 | X[d] |
| n. Judgment........... | 100 | 43 | 39 | 11 | 1 | 0 | 4 | X[d] |
| o. Efficiency......... | 100 | 60 | 29 | 7 | 1 | X[d] | 0 | 1 |
| Dependability: 11 Items........ | 100 | 67 | 21 | 8 | 1 | X[d] | 1 | X[d] |
| Each item[b] of.......... | | | | | | | | |
| a. Utilization of time | 100 | 62 | 25 | 9 | 3 | 0 | 1 | X[d] |
| h. Utilization of time | 100 | 71 | 23 | 4 | 0 | 0 | 1 | X[d] |
| i. Utilization of time | 100 | 70 | 21 | 6 | 2 | X[d] | 0 | 0 |
| k. Utilization of time | 100 | 62 | 28 | 9 | X[d] | 0 | 0 | X[d] |
| b. Attendance......... | 100 | 56 | 21 | 11 | 3 | X[d] | 6 | 1 |
| c. Attendance......... | 100 | 69[c] | 16 | 12 | 1 | 0 | X[d] | X[d] |
| d. Attendance......... | 100 | 70[c] | 16 | 9 | 2 | 0 | 1 | 1 |
| e. Attendance......... | 100 | 59 | 30 | 6 | 3 | 0 | 1 | 1 |
| f. Attendance......... | 100 | 72 | 18 | 7 | 2 | 0 | X[d] | 0 |
| g. Attendance......... | 100 | 69 | 21 | 8 | 1 | 0 | X[d] | X[d] |
| j. Consults Supervisor | 100 | 73[c] | 18 | 7 | X[d] | X[d] | 0 | X[d] |

TABLE 21
(continued)

| Item | Total of 141 C.T. | Job Performance Rating | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Excellent | Good | Average | Less than Average | Unsatisfactory | Does not Apply | No Reply |
| PERCENT[a] rated for each category (continued) | % | % | % | % | % | % | % | % |
| Reliability: 12 Items.......... | 100 | 58 | 23 | 7 | $X^d$ | $X^d$ | 11 | $X^d$ |
| Each item[b] of | | | | | | | | |
| a. Techniques......... | 100 | 71 | 23 | 4 | 0 | 0 | 2 | 0 |
| b. Techniques......... | 100 | 69 | 21 | 6 | 2 | $X^d$ | 0 | 1 |
| g. Techniques......... | 100 | 41 | 20 | 14 | $X^d$ | 0 | 23 | 1 |
| h. Techniques......... | 100 | 52 | 16 | 6 | 0 | 0 | 26 | $X^d$ |
| i. Techniques......... | 100 | 60 | 11 | 6 | 0 | 0 | 22 | $X^d$ |
| j. Techniques......... | 100 | 63 | 17 | 5 | 0 | 0 | 13 | 2 |
| c. Judgment........... | 100 | 50[c] | 36 | 9 | 3 | 0 | 1 | $X^d$ |
| d. Judgment........... | 100 | 71 | 24 | 4 | $X^d$ | 0 | 0 | 0 |
| e. Judgment........... | 100 | 60 | 23 | 9 | 1 | 0 | 5 | 1 |
| f. Judgment........... | 100 | 50 | 23 | 9 | 2 | 0 | 14 | $X^d$ |
| k. Quality Control.... | 100 | 54 | 33 | 7 | $X^d$ | 0 | 5 | $X^d$ |
| l. Quality Control.... | 100 | 52[c] | 24 | 4 | $X^d$ | 0 | 18 | 1 |
| Initiative: 16 Items.......... | 100 | 48 | 26 | 12 | 3 | $X^d$ | 11 | 1 |
| Each item[b] of | | | | | | | | |
| a. Work Accomplishment | 100 | 51 | 27 | 14 | 4 | 1 | 3 | $X^d$ |
| c. Work Accomplishment | 100 | 42 | 28 | 15 | 3 | $X^d$ | 11 | 1 |
| d. Work Accomplishment | 100 | 57 | 28 | 11 | $X^d$ | 0 | 3 | $X^d$ |
| f. Work Accomplishment | 100 | 55 | 30 | 11 | 2 | 1 | 0 | $X^d$ |
| l. Work Accomplishment | 100 | 43 | 18 | 7 | 0 | 0 | 31 | 2 |
| m. Work Accomplishment | 100 | 52 | 25 | 11 | 0 | $X^d$ | 11 | $X^d$ |
| n. Work Accomplishment | 100 | 53 | 27 | 13 | 2 | 0 | 4 | 2 |
| o. Work Accomplishment | 100 | 50 | 29 | 8 | 4 | $X^d$ | 7 | $X^d$ |
| b. Personal Relations. | 100 | 57 | 28 | 7 | 4 | $X^d$ | 4 | $X^d$ |
| j. Personal Relations. | 100 | 37 | 33 | 15 | 2 | $X^d$ | 11 | 2 |
| e. Continuing Education | 100 | 38 | 33 | 19 | 6 | 1 | $X^d$ | $X^d$ |
| g. Continuing Education | 100 | 49 | 21 | 16 | 3 | 4 | 4 | 4 |
| h. Continuing Education | 100 | 43 | 15 | 14 | 3 | 2 | 21 | 3 |
| i. Continuing Education | 100 | 36 | 22 | 14 | 3 | 1 | 21 | 3 |
| k. Teaching........... | 100 | 40 | 17 | 4 | 2 | 0 | 36 | 1 |
| p. Judgment........... | 100 | 55 | 30 | 11 | 2 | $X^d$ | 0 | $X^d$ |

## TABLE 21
(continued)

| Item | Total of 141 C.T. | Job Performance Rating | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Excellent | Good | Average | Less than Average | Unsatisfactory | Does not Apply | No Reply |
| PERCENT[a] rated for each category (continued) | % | % | % | % | % | % | % | % |
| Personal Relations: 6 Items.... | 100 | 62 | 23 | 10 | 3 | X[d] | X[d] | 1 |
| Each item[b] of | | | | | | | | |
| a. Peers.............. | 100 | 57 | 28 | 12 | 2 | X[d] | 0 | X[d] |
| b. Peers.............. | 100 | 62 | 26 | 8 | 4 | 0 | 0 | 1 |
| c. Supervision........ | 100 | 58 | 25 | 11 | 4 | 1 | X[d] | X[d] |
| d. Laboratory Assistant | 100 | 57 | 21 | 10 | 4 | X[d] | 6 | 1 |
| e. Appearance......... | 100 | 75[c] | 14 | 11 | X[d] | 0 | 0 | X[d] |
| f. Temperament........ | 100 | 66[c] | 23 | 6 | 1 | X[d] | 0 | 2 |

a. The "Total" is entered as 100% to indicate the horizontal direction of summation in this table. The actual sum of percents varies from 98 through 101% because all are adjusted to the nearest whole number.

b. The letters preceding titles identify items in the rating form completed by the supervisor. The complete list of items is in the Appendix.

c. Comparison of item rating distribution for 141 cytotechnologists who passed and 17 cytotechnologists who failed the 1965 certification examination. Calculations of chi square distribution (Kolmogorov-Smirnov formula) shows that these figures are statistically significant because the frequency of replies exceeds the indicated probability level.

1) Dependability c: $X^2 = 7.21$; df = 2, $X^2 = 5.99$ (0.05 probability level)
   More of Passed Exam group rated excellent
2) Dependability d: $X^2 = 5.57$; df = 2, $X^2 = 4.61$ (0.10 probability level)
   More of Passed Exam group rated excellent
3) Dependability j: $X^2 = 6.36$; df = 2, $X^2 = 5.99$ (0.05 probability level)
   More of Passed Exam group rated excellent
4) Reliability c: $X^2 = 4.72$; df = 2, $X^2 = 4.61$ (0.10 probability level)
   More of Passed Exam group rated excellent
5) Reliability l: $X^2 = 5.00$; df = 2, $X^2 = 4.61$ (0.10 probability level)
   More of Passed Exam group rated excellent
6) Personal Relations e: $X^2 = 4.73$; df = 2, $X^2 = 4.61$ (0.10 probability level)
   More of Passed Exam group rated excellent
7) Personal Relations f: $X^2 = 6.24$; df = 2, $X^2 = 5.99$ (0.05 probability level)
   More of Passed Exam group rated excellent

d. X = Less than 1%.

## TABLE 22

## JOB PERFORMANCE RATINGS FOR 17 CYTOTECHNOLOGISTS WHO FAILED THE 1965 CERTIFICATION EXAMINATION

| Item | Total of 17 C.T. | Job Performance Rating | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Excellent | Good | Average | Less than Average | Unsatisfactory | Does not Apply | No Reply |
| PERCENT[a] rated for | % | % | % | % | % | % | % | % |
| 60 Items.................... | 100 | 41 | 37 | 14 | 2 | 0 | 6 | X[d] |
| Skills: 15 Items............... | 100 | 43 | 36 | 16 | 2 | 0 | 3 | 0 |
| Each item[b] of | | | | | | | | |
| a. Techniques......... | 100 | 53 | 24 | 12 | 0 | 0 | 12 | 0 |
| b. Techniques......... | 100 | 47 | 24 | 6 | 6 | 0 | 18 | 0 |
| d. Techniques......... | 100 | 47 | 53 | 0 | 0 | 0 | 0 | 0 |
| e. Techniques......... | 100 | 47 | 41 | 12 | 0 | 0 | 0 | 0 |
| g. Techniques......... | 100 | 41 | 47 | 12 | 0 | 0 | 0 | 0 |
| h. Techniques......... | 100 | 47 | 47 | 6 | 0 | 0 | 0 | 0 |
| i. Techniques......... | 100 | 53 | 29 | 18 | 0 | 0 | 0 | 0 |
| c. Instrumentation.... | 100 | 41 | 41 | 12 | 0 | 0 | 6 | 0 |
| f. Instrumentation.... | 100 | 47 | 35 | 18 | 0 | 0 | 0 | 0 |
| j. Judgment........... | 100 | 41 | 41 | 12 | 0 | 0 | 6 | 0 |
| k. Judgment........... | 100 | 41 | 24 | 29 | 6 | 0 | 0 | 0 |
| l. Judgment........... | 100 | 35 | 35 | 29 | 0 | 0 | 0 | 0 |
| m. Judgment........... | 100 | 35 | 35 | 18 | 12 | 0 | 0 | 0 |
| n. Judgment........... | 100 | 29 | 35 | 29 | 6 | 0 | 0 | 0 |
| o. Efficiency......... | 100 | 41 | 35 | 24 | 0 | 0 | 0 | 0 |
| Dependability: 11 Items........ | 100 | 45 | 40 | 11 | 1 | 0 | 3 | X[d] |
| Each item[b] of | | | | | | | | |
| a. Utilization of time | 100 | 53 | 35 | 12 | 0 | 0 | 0 | 0 |
| h. Utilization of time | 100 | 53 | 41 | 6 | 0 | 0 | 0 | 0 |
| i. Utilization of time | 100 | 53 | 41 | 0 | 6 | 0 | 0 | 0 |
| k. Utilization of time | 100 | 53 | 18 | 24 | 0 | 0 | 0 | 6 |
| b. Attendance.......... | 100 | 29 | 18 | 18 | 0 | 0 | 35 | 0 |
| c. Attendance.......... | 100 | 35[c] | 47 | 18 | 0 | 0 | 0 | 0 |
| d. Attendance.......... | 100 | 41[c] | 47 | 6 | 6 | 0 | 0 | 0 |
| e. Attendance.......... | 100 | 41 | 47 | 12 | 0 | 0 | 0 | 0 |
| f. Attendance.......... | 100 | 47 | 47 | 6 | 0 | 0 | 0 | 0 |
| g. Attendance.......... | 100 | 47 | 41 | 12 | 0 | 0 | 0 | 0 |
| j. Consults Supervisor. | 100 | 41[c] | 53 | 6 | 0 | 0 | 0 | 0 |

## TABLE 22
(continued)

| Item | Total of 17 C.T. | Job Performance Rating | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Excellent | Good | Average | Less than Average | Unsatisfactory | Does not Apply | No Reply |
| PERCENT[a] rated for (continued) | % | % | % | % | % | % | % | % |
| Reliability: 12 Items........... | 100 | 43 | 34 | 13 | 3 | 0 | 6 | 0 |
| Each item[b] of | | | | | | | | |
| a. Techniques............... | 100 | 59 | 41 | 0 | 0 | 0 | 0 | 0 |
| b. Techniques............... | 100 | 53 | 35 | 12 | 0 | 0 | 0 | 0 |
| g. Techniques............... | 100 | 35 | 29 | 18 | 6 | 0 | 12 | 0 |
| h. Techniques............... | 100 | 47 | 29 | 0 | 0 | 0 | 24 | 0 |
| i. Techniques............... | 100 | 47 | 35 | 6 | 0 | 0 | 12 | 0 |
| j. Techniques............... | 100 | 53 | 35 | 6 | 0 | 0 | 6 | 0 |
| c. Judgment................. | 100 | 24[c] | 53 | 24 | 0 | 0 | 0 | 0 |
| d. Judgment................. | 100 | 53 | 29 | 18 | 0 | 0 | 0 | 0 |
| e. Judgment................. | 100 | 47 | 29 | 12 | 12 | 0 | 0 | 0 |
| f. Judgment................. | 100 | 29 | 29 | 29 | 6 | 0 | 6 | 0 |
| k. Quality Control.......... | 100 | 41 | 29 | 18 | 6 | 0 | 6 | 0 |
| l. Quality Control.......... | 100 | 29[c] | 35 | 18 | 6 | 0 | 12 | 0 |
| Initiative: 16 Items............ | 100 | 35 | 33 | 18 | 3 | 0 | 11 | 1 |
| Each item[b] of | | | | | | | | |
| a. Work Accomplishment...... | 100 | 47 | 24 | 24 | 6 | 0 | 0 | 0 |
| c. Work Accomplishment...... | 100 | 29 | 41 | 24 | 0 | 0 | 6 | 0 |
| d. Work Accomplishment...... | 100 | 47 | 41 | 12 | 0 | 0 | 0 | 0 |
| f. Work Accomplishment...... | 100 | 41 | 35 | 18 | 0 | 0 | 0 | 6 |
| l. Work Accomplishment...... | 100 | 29 | 18 | 0 | 0 | 0 | 47 | 6 |
| m. Work Accomplishment...... | 100 | 35 | 29 | 24 | 6 | 0 | 6 | 0 |
| n. Work Accomplishment...... | 100 | 35 | 41 | 18 | 0 | 0 | 6 | 0 |
| o. Work Accomplishment...... | 100 | 35 | 35 | 18 | 0 | 0 | 12 | 0 |
| b. Personal Relations....... | 100 | 35 | 35 | 12 | 0 | 0 | 18 | 0 |
| j. Personal Relations....... | 100 | 29 | 41 | 6 | 18 | 0 | 6 | 0 |
| e. Continuing Education..... | 100 | 29 | 35 | 35 | 0 | 0 | 0 | 0 |
| g. Continuing Education..... | 100 | 41 | 29 | 29 | 0 | 0 | 0 | 0 |
| h. Continuing Education..... | 100 | 41 | 35 | 6 | 6 | 0 | 12 | 0 |
| i. Continuing Education..... | 100 | 12 | 47 | 12 | 6 | 0 | 24 | 0 |
| k. Teaching................. | 100 | 24 | 18 | 12 | 0 | 0 | 35 | 12 |
| p. Judgment................. | 100 | 41 | 24 | 35 | 0 | 0 | 0 | 0 |

## TABLE 22
(continued)

| Item | Total of 17 C.T. | Job Performance Rating | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Excellent | Good | Average | Less than Average | Unsatisfactory | Does not Apply | No Reply |
| PERCENT[a] rated for (continued) | % | % | % | % | % | % | % | % |
| Personal Relations: 6 Items.... | 100 | 41 | 46 | 7 | 4 | 0 | 2 | 0 |
| Each item[b] of | | | | | | | | |
| a. Peers.................. | 100 | 53 | 35 | 6 | 6 | 0 | 0 | 0 |
| b. Peers.................. | 100 | 41 | 41 | 12 | 6 | 0 | 0 | 0 |
| c. Supervision............ | 100 | 35 | 59 | 0 | 6 | 0 | 0 | 0 |
| d. Laboratory Assistant.... | 100 | 35 | 41 | 12 | 0 | 0 | 12 | 0 |
| e. Appearance............. | 100 | 47[c] | 47 | 6 | 0 | 0 | 0 | 0 |
| f. Temperament............ | 100 | 35[c] | 53 | 6 | 6 | 0 | 0 | 0 |

a. The "Total" is entered as 100% to indicate the horizontal direction of summation in this table. The actual sum of percents varies from 99 through 101% because all are adjusted to the nearest whole number.

b. The letters preceding titles identify items in the rating form completed by the supervisor. The complete list of items is in the Appendix.

c. Comparison of item rating distribution for 141 cytotechnologists who passed and 17 cytotechnologists who failed the 1965 certification examination. Calculation of chi square distribution (Kolmogorov-Smirnov formula) shows that these figures are statistically significant because the frequency of replies exceeds the indicated probability level.

1) Dependability c: $X^2 = 7.21$; df = 2, $X^2 = 5.99$ (0.05 probability level)
Fewer of Failed Exam group rated excellent
2) Dependability d: $X^2 = 5.57$; df = 2, $X^2 = 4.61$ (0.10 probability level)
Fewer of Failed Exam group rated excellent
3) Dependability j: $X^2 = 6.36$; df = 2, $X^2 = 5.99$ (0.05 probability level)
Fewer of Failed Exam group rated excellent
4) Reliability c: $X^2 = 4.72$; df = 2, $X^2 = 4.61$ (0.10 probability level)
Fewer of Failed Exam group rated excellent
5) Reliability l: $X^2 = 5.00$; df = 2, $X^2 = 4.61$ (0.10 probability level)
Fewer of Failed Exam group rated excellent
6) Personal Relations e: $X^2 = 4.73$; df = 2, $X^2 = 4.61$ (0.10 probability level)
Fewer of Failed Exam group rated excellent
7) Personal Relations f: $X^2 = 6.24$; df = 2, $X^2 = 5.99$ (0.05 probability level)
Fewer of Failed Exam group rated excellent

d. X = Less than 1%.

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# APPENDIX A
# Methodology

This report culminates the cytotechnologist study which was designed to acquire information about relationships among educational achievement, certification examination scores and job performance of cytotechnologists. This section of the report presents the method of obtaining and analyzing the data obtained from files of the offices of the Boards of Registry of Medical Technologists and Schools of Medical Technology (ASCP) as well as questionnaires received from cytotechnologists and their laboratory supervisors.

The cytotechnologists selected for this study were the candidates for the 1965 certification examination in exfoliative cytology administered by the Board of Registry of Medical Technologists (ASCP). This group was selected because it was the largest taking the examination with sufficient working experience to enable completion of the cytotechnologist questionnaire and for laboratory supervisors to evaluate individuals' job performance. This group consists of 358 people of whom 307 passed and 51 failed the 1965 certification examination.

The office of the Registry of Medical Technologists (ASCP) maintains a file for each applicant for the examination in exfoliative cytology containing a transcript of college credit hours earned (or, in lieu of the transcript, a form summarizing credit hours accepted toward fulfillment of prerequisites) and a performance evaluation from the school of cytotechnology or other clinical program attended. Information about college credit hours was available from this file for 306 of the cytotechnologists. The credit hours were transferred to a keypunch code sheet according to those recorded on transcripts and those recorded on forms substituting for transcripts. The record of transcript credit hours was divided to show the number of credit hours earned in A, B, and C grades ("satisfactory performance") and the credit hours earned in D and F grades ("unsatisfactory performance"). The number of total credit hours earned was recorded separately from the number earned in science courses without indication of grades.

Performance evaluations of clinical study were recorded as confirmed by directors of programs on forms provided by the Registry office. Information was transferred to keypunch code sheets in numbers one through four representing the ratings of "excellent", "good", "fair", and "poor". Only one rating was given for the entire period of training. In some instances, however, the cytotechnologists received their clinical study in two institutions in which case the evaluations by both institutions were recorded in appropriately designated columns in the keypunch code sheet.

The Registry office provided identification numbers for each school of cytotechnology within each state attended by the cytotechnologists surveyed. The institutions attended which were not A.M.A. accredited schools of cytotechnology were identified by the state code number and additional numbers designated by the study staff.

The raw scores from the 1965 certification examination were also provided by the Registry office. These included scores for the written and practical sections of the examination.

The Board of Schools of Medical Technology (ASCP) permitted the use of annual reports filed with its office for the 82 schools of cytotechnology accredited in 1964 and 1965. These reports provided descriptive data regarding qualifications of school directors, qualifications and size of technical staffs, laboratory workloads, and related information which were transferred to keypunch code sheets.

During July 1967, questionnaires were sent from the National Council on Medical Technology Education to each of the 358 cytotechnologists in the study population requesting information concerning their location, type and length of employment; and various matters relating to their education programs and work. Each of the cytotechnologists was requested to submit the name of his immediate laboratory supervisor. This questionnaire is reproduced in Appendix C. Completed questionnaires were returned by 249 (70%) of the 358 cytotechnologists of whom 222 passed and 27 failed the 1965 certification examination.

Each of the laboratory supervisors named by the reporting cytotechnologists were then sent questionnaires by the National Council on Medical Technology Education during August and September, 1967. On questionnaire A each supervisor was asked to evaluate the job performance of the cytotechnologist indicated according to 60 items relating to skills, dependability, reliability, initiative, and personal relations. The ratings were recorded by six indices, "excellent", "good", "average", "less than average", "unsatisfactory", and "does not apply". On questionnaire B each supervisor was asked to provide information about his own education and work experience. These questionnaires are reproduced in Appendix D. Of the 249 supervisors surveyed, 158 returned job evaluation forms (Questionnaire A) and 126 returned information about themselves (Questionnaire B).

The Cytotechnologist Questionnaire and Supervisors Questionnaires (A and B) were prepared with the assistance of the consultants to NCMTE. They were pre-tested by appropriate people in two laboratories in Memphis, Tennessee and one laboratory in Baltimore, Maryland. Revisions were made according to the reactions of the people involved in the pre-test program.

Each of the cytotechnologists was assigned a study number, consecutively, according to the "Pass" and "Fail" groups. This system facilitated distinction of the "Pass" and "Fail" groups as well as identification of cytotechnologists who did not have certification numbers because they did not pass the examination in 1965 or subsequently. Study numbers were assigned to the laboratory supervisors as their completed forms were received in the NCMTE office.

All data were organized and assigned to the following decks of IBM cards:

Deck 1: Cytotechnologists' certification examination scores for the 1965 certification examination in exfoliative cytology and performance rating in clinical study. (Obtained from files in the office of the Registry of Medical Technologists (ASCP)) N = 358

Deck 2: Academic credit hours taken by the cytotechnologists. (College transcript and Registry form for credit hours from files in the office of the Registry of Medical Technologists (ASCP)) N = 358

Deck 3: Information from the 1964 and 1965 annual reports of the schools of cytotechnology. (From the files of the office of the Board of Schools of Medical Technology (ASCP)) N = 82

Modified deck combining cards from Deck 3 and Deck 1 to identify cytotechnologists with schools of cytotechnology. N = 313

Deck 4: Rating of cytotechnologists' job performance. (Supervisors Form A) N = 158

Deck 5: Information about education and working experience of laboratory supervisors. (Supervisors Form B) N = 126

Deck 6: Information about location and type of work for cytotechnologists. (Cytotechnologists Questionnaire) N = 249

Deck 7: Information about quality control measures used by cytotechnologists in their education programs and work. (Cytotechnologists Questionnaire) N = 249

Deck 8: Information about procedures and techniques performed by cytotechnologists in their education programs and work. (Cytotechnologists Questionnaire) N = 249

Each card in each deck was commonly identified by the cytotechnologists' and laboratory supervisors' Registry certification number (where applicable) and respective study numbers.

All data were processed on an IBM 1620 computer at the Yalem Scientific Computer Center at St. Louis University (St. Louis, Missouri) under the direction of Mr. Robert Sullivan and Miss Marguerite Inglis. The relationships attempted and reported were derived by members, staff and consultants of the National Council on Medical Technology Education with advice from the computer center staff. Findings were derived from single and double column item analysis of data on all decks of cards, arithmetic means of job performance ratings, and chi square test for distribution (where possible). The programs used for all analyses were obtained from the Yalem Scientific Computer Center. Statistically significant relationships were determined through use of the chi square and Kolmogorov-Smirnov formulae for distribution.

# APPENDIX B

# History

The National Council on Medical Technology Education grew out of a concerted effort over an eight-year period to appraise the educational preparation of medical laboratory personnel.

In October 1956 the Medical Technology Study Committee (an ad hoc joint committee of the American Society of Clinical Pathologists and American Society of Medical Technologists) met with research consultants and representatives of medical, paramedical and hospital organizations to assess various professional and legislative facets of medical technology. This deliberation culminated in the recommendation that the National Committee for Careers in Medical Technology 1/ endeavor to obtain financial support for a national study of the education and utilization of medical laboratory personnel. Several attempts to do so were unsuccessful.

## The Alabama Project

Three years later, in 1959, the National Committee for Careers in Medical Technology did obtain funds to conduct a pilot study on medical technology education in Alabama. This "Alabama Pilot Study" (subsequently known as the Alabama Project) developed from requests by the Alabama State Society of Medical Technologists and American Society of Medical Technologists and was financed through the Cancer Control Program of the United States Public Health Service. Its objectives were

1. to find ways and means of increasing and improving the quality of medical technology instruction in Alabama;
2. to find ways of increasing cancer cytologic training of medical technologists; and
3. to provide specialized cytologic training.2/

The Alabama Project was supervised by Joseph A. Cunningham, M.D. (Project Director), Mrs. Sara Crowson, M.T.(ASCP) and Mrs. Frances Wideman, M.T.(ASCP) (Field Coordinators). It was conducted in three phases.

During Phase I, the staff assembled information on current programs in schools of medical technology through surveys designed to explore the following areas of need:

"1. Encouraging formalization of the schools of medical technology,
2. Faculty development,
3. Developing resource material,
4. Assisting teaching supervisors in improving their skills,
5. Strengthening the interest of Alabama colleges in the teaching programs of the AMA-Approved schools,
6. Cooperation with recruitment efforts of the Alabama State Society of Medical Technologists."

---

1/ The National Committee for Careers in Medical Technology is an incorporated organization consisting of representatives of the American Society of Clinical Pathologists, American Society of Medical Technologists and College of American Pathologists.

2/ The Alabama Pilot Study. Final report of a three-year project (1959-1962) for the improvement of medical technology education. Sponsored by the National Committee for Careers in Medical Technology through the United States Public Health Service Contract #73071.

These surveys were evaluated at a meeting of school directors and teaching supervisors where priorities were assigned in the following order:

1. Budgetary considerations,
2. Space requirements,
3. Strengthening college affiliations,
4. Improving communications among schools of medical technology,
5. Providing teaching aids, and
6. Developing teaching skills of instructors.

These suggestions were implemented in Phase II through a conference of directors of six schools of medical technology and ten Alabama colleges. They recommended that

1. representatives of the programs concerned meet every third year to review their respective programs and the success of their graduates in the certification examination administered by the Registry of Medical Technologists (ASCP); and
2. respective facilities of closely affiliated colleges and schools of medical technology meet annually to discuss student deficiencies.

Communications between schools of medical technology were facilitated through publication of a newsletter, "The Alabama Pilot". Methods for developing teaching skills were introduced to instructors through

1. seminars on student evaluation and difficulties with teaching methods in medical technology;
2. a course on problem situations in supervision; and
3. workshops in the preparation and use of teaching aids, laboratory instrumentation and fluorescence micróscopy.

In addition, the preparation and use of teaching aids were emphasized by publishing and distributing lists of pertinent films, film strips and slide collections; and acquiring films and slides in blood banking, coagulation, blood cell morphology, cytology and histologic technique.

The objectives relating to cytotechnology were implemented through a survey of Alabama pathologists to determine needs for instruction and recruitment in medical technology. The project activities included

1. acquisition of scholarship funds for student support,
2. development of instructional material,
3. publication of a newsletter for the exchange of information among schools of cytotechnology,
4. intensive recruitment of students, and
5. a workshop in endometrial carcinoma.

Phase III comprised the evaluation of all project activities which indicated progress in all areas and emphasized needs for and interest in their continuation.

## The National Council on Medical Technology Education

In October 1962 a group of 24 representatives of agencies concerned with education in medical technology and cytotechnology met to study the findings and recommendations of the Alabama Project. They recommended unanimously "...that a pilot study be set up to test whether a central education office could do for all Approved Schools of Medical Technology the many things accomplished by the Alabama Project for the Alabama Schools as well as fulfilling other needs."2/

As a direct consequence, the National Council on Medical Technology Education was formed in July 1964, under the sponsorship of the National Committee for Careers in Medical Technology and through the support of the Cancer Control Branch of the Division of Chronic Diseases, United States Public Health Service.3/ The N.C.C.M.T. chairman, Robert Horn, Jr., M.D., appointed as members of the Council

Merlin L. Trumbull, M.D. (Chairman and Project Director)
Nellie May Bering, B.S.,M.T.(ASCP)
Joseph A. Cunningham, M.D.
Mary Frances James, M.S.,M.T.(ASCP)
John B. Miale, M.D.

---

3/ Community Cancer Demonstration Project Grant Number 5514-A-65

He appointed as staff and consultants
    Ruth I. Heinemann, B.S.,M.T.(ASCP) (Program Coordinator)
    W. I. Christopher, M.H.A. (Consultant)
    Robert Richart, Ph.D. (Consultant)
Subsequent appointments include
    Arch Lugenbeel, M.Ed. (Education Associate)
    Frances Kaplan, M.A., (Consultant)
    Arline Howdon, B.A.,C.T.(ASCP) (Consultant)
    Irma Rube, M.S.,C.T.(ASCP) (Consultant)
Drs. Trumbull and Miale resigned in 1966 and were replaced by Rex Couch, M.D. and Tyra T. Hutchens, M.D.

In their first meeting in October 1964 the members of the Council concurred in a need for further baseline information about medical technology education prior to implementation of the Alabama Project recommendations. This conviction derived from the realization that various boards and committees involved in the education and certification of medical technologists were then considering the basic question of whether or not current and future demands in this rapidly developing profession were being met through established programs of education in medical technology. Accordingly, they took action to confine their initial projects to studies in depth of the academic, technical, graduate and continuing education programs for medical technologists, cytotechnologists and certified laboratory assistants in order to determine directions of future service in the development of these programs.

The projects initiated by the Council to date are

1. Medical Technologist Study, Certified Laboratory Assistant Study, and Cytotechnologist Study. These surveys are intended to examine the relationships between educational preparation and job performance of laboratory personnel.
2. Back-to-Work Project. This project consists of the location of medical technologists not currently active in their profession and the organization of retraining programs for those who wish to resume such activity.
3. Continuing Education. Following development of a training grants program for experienced medical technologists, the Council intends to survey existing graduate degree programs and to assist in the establishment of new programs.
4. Community College. A joint committee of the National Council on Medical Technology Education and the American Association of Junior Colleges has been formed to consider guidelines for curricula appropriate for two-year colleges in medical laboratory personnel education.

The Medical Technologist Study was published in August 1967 under the title of National Correlations in Medical Technology Education. The report of the Cytotechnologist Study was completed in May 1968 under the title of Report of a National Study of Cytotechnologists: Education and Performance Relationships. The report of an informal survey, Graduate Study Interests of Medical Technologists, was published in the American Journal of Medical Technology, Volume 33, No. 6-November-December 1967.

## APPENDIX C

# Questionnaire to Cytotechnologists and Introductory Letters

NATIONAL COUNCIL ON MEDICAL TECHNOLOGY EDUCATION
1025 E. H. Crump Boulevard
Memphis, Tennessee 38104

## CYTOTECHNOLOGIST STUDY

### Questionnaire to Cytotechnologists

Please give or select the answer most descriptive of you, your job or your impressions.

1. Name: ____________________
(Last) (First) (Middle) (Maiden)

2. Certification: C.T.(ASCP) # ____________
M.T.(ASCP) # ____________
Other (Please specify type and number) ____________

3. What is the total length of time that you have worked as a cytotechnologist?

| | |
|---|---|
| ____ 6 months or less | ____ 31 through 36 months |
| ____ 7 through 12 months | ____ 37 through 42 months |
| ____ 13 through 24 months | ____ 43 through 48 months |
| ____ 25 through 30 months | ____ 49 months or more<br>Please specify number ____ |

4. Education

a. How much college education have you had?

____ None
____ Less than 1 year
____ 1 year
____ 2 years
____ 3 years
____ 4 years
____ More than 4 years (Please specify number) ____

b. What college degree do you have?

____ None
____ Associate
____ Bachelor's
____ Master's
____ Doctorate

c. What A.M.A. accredited school of cytotechnology did you attend?
(Note: If the laboratory where you had your training was not an accredited school of cytotechnology, please give the name of the laboratory (or institution) and indicate that it was not an accredited school.)

Name of Institution: ____________________

Address: ____________________
(Street)
____________________
(City) (State) (Zip Code)

d. How long did you attend the school of cytotechnology?
(Note: If the laboratory where you had your training was not an accredited school of cytotechnology, please give the total length of time you spent in the training program you attended.)

____ 6 months
____ 12 months
____ Other (Please specify number of months) ____

4. Education (continued)
   e. If you attended the school of cytotechnology for less than 12 months, where did you have the full time experience necessary to complete the 12 month requirements for taking the certification examination?

      Name of Institution: ______________________________

      Address: ______________________________
      (Street)

      ______________________________
      (City) (State) (Zip Code)

      1) How many months did you spend at this institution to complete your clinical study (training)?
         _____ 6 months
         _____ 5 months
         _____ 4 months
         _____ 3 months
         _____ Other (Please specify number of months) _____

      2) Did you have regularly scheduled lectures and/or conferences with your instructors (supervisors) as a part of the clinical study (training) program at this institution?
         _____ Yes
         _____ No
         _____ Other (Please specify) ______________________________

5. Place of full time employment
   a. Where do you work?
      Name of Institution: ______________________________

      Address: ______________________________
      (Street)

      ______________________________
      (City) (State) (Zip Code)

   b. Who is the director of the cytology laboratory where you are working?
      Name: ______________________________

| | | |
|---|---|---|
| _____ M.D. Pathologist | _____ M.D.: Not Pathologist | _____ Not M.D. |
| _____ Full Time[1] | _____ Full Time[1] | _____ Full Time[1] |
| _____ Part Time[2] | _____ Part Time[2] | _____ Part Time[2] |
| _____ Consultant[3] | _____ Consultant[3] | _____ Consultant[3] |

      Address: (Complete only if director is part time or consultant)

      ______________________________
      (Street)

      ______________________________
      (City) (State) (Zip Code)

---

1. Full Time: "In residence" in the institution in which you are employed and available to medical and laboratory staffs for consultation at all times.
2. Part Time: Not "In residence" in the institution in which you are employed. Visits your laboratory frequently (4 hours or less per day and 2 days or more per week.)
3. Consultants: Not "In residence" in the institution in which you are employed. Visits your laboratory infrequently (less than 2 days per week.)

5. Place of full time employment (continued)

c. How long have you worked at this institution as a cytotechnologist?

_____ 6 months or less
_____ 7 - 12 months
_____ 13 - 18 months
_____ 19 - 24 months
_____ 25 - 30 months
_____ 31 - 36 months
_____ 37 - 42 months
_____ 43 - 48 months
_____ 49 months or more
_____ Please specify number

d. What are your working hours and in what type of laboratory are you working?
(Note: If you have both full time and part time positions, please complete all pertinent sections.)

1) Full Time (35 or more hours per week)

a) Time:
_____ Day
_____ Day and weekend
_____ Day and night
_____ Day, weekend and night
_____ Other (Please specify) ______________________________

b) Location: (Please check all of the departments where you work and give the approximate percent of time you spend in cytology and/or pathology.)

_____ Hospital (Include private, federal, state, county, city, university, etc. institutions which have bed patients.)
    _____ Cytology _____ % of time
    _____ Pathology (Including cytology) _____ % of time
    _____ Hematology
    _____ Chemistry
    _____ Microbiology
    _____ Blood Bank
    _____ Other (Please specify) ______________________________

_____ Independent (Including clinic or doctors' office)
    _____ Cytology _____ % of time
    _____ Pathology (Including cytology) _____ % of time
    _____ Hematology
    _____ Chemistry
    _____ Microbiology
    _____ Blood Bank
    _____ Other (Please specify) ______________________________

_____ Public Health (Only non-hospital: federal, state, county, city)
    _____ Cytology _____ % of time
    _____ Pathology (Including cytology) _____ % of time
    _____ Microbiology
    _____ Other (Please specify) ______________________________

2) Part Time (Less than 35 hours per week)

a) Time:
_____ Day
_____ Day and weekend
_____ Day and night
_____ Day, weekend and night
_____ Other (Please specify) ______________________________

5. d. (continued)
2) b) Location: (Please check all of the departments where you work and give the approximate percent of time you spend in cytology and/or pathology.)

_____ Hospital (Include private, federal, state, county, city, university, etc. institutions which have bed patients.)
_____ Cytology _____ % of time
_____ Pathology (Including cytology) _____ % of time
_____ Hematology
_____ Chemistry
_____ Microbiology
_____ Blood Bank
_____ Other (Please specify) _____

_____ Independent (Including clinic or doctors' office)
_____ Cytology _____ % of time
_____ Pathology (Including cytology) _____ % of time
_____ Hematology
_____ Chemistry
_____ Microbiology
_____ Blood Bank
_____ Other (Please specify) _____

_____ Public Health (Only non-hospital: federal, state, county, city)
_____ Cytology _____ % of time
_____ Pathology (Including cytology) _____ % of time
_____ Microbiology
_____ Other (Please specify) _____

e. What type of position do you have now?
(Note: If you have both full and part time positions, please indicate the type for both and whether they are full or part time.)

_____ Supervisory
_____ Chief Cytotechnologist, _____ Full Time _____ Part Time
_____ Section Chief: Cytopreparation, _____ Full Time _____ Part Time
_____ Section Chief: Cytoscreening, _____ Full Time _____ Part Time
_____ Chief of Research Laboratory, _____ Full Time _____ Part Time
_____ Teaching Supervisor (School of Cytotechnology)
_____ Full Time _____ Part Time
_____ Assist with teaching, _____ Full Time _____ Part Time
_____ by lecturing (basic sciences, cytology)
_____ by giving practical instruction in the laboratory
_____ by giving practical examinations
_____ other (Please specify) _____

_____ Non-supervisory ("Staff")
_____ Chief Cytotechnologist, _____ Full Time _____ Part Time
_____ Section Chief: Cytopreparation, _____ Full Time _____ Part Time
_____ Section Chief: Cytoscreening, _____ Full Time _____ Part Time
_____ Chief of Research Laboratory, _____ Full Time _____ Part Time
_____ Teaching Supervisor (School of Cytotechnology
_____ Full Time _____ Part Time
_____ Assist with teaching, _____ Full Time _____ Part Time
_____ by lecturing (basic sciences, cytology)
_____ by giving practical instruction in the laboratory
_____ by giving practical examinations
_____ other (Please specify) _____

_____ Sole Cytotechnologist (Only person in department doing all preparation and screening)
_____ Full Time _____ Part Time

5. f. How long have you held your present position?
_____ 6 months or less
_____ 7 - 12 months
_____ 13 - 18 months
_____ 19 - 24 months
_____ 25 - 30 months
_____ 31 - 36 months
_____ 37 - 42 months
_____ 43 - 48 months
_____ 49 months or more
Please spedify number _____

g. Are you working in the same geographic area where you attended the school of cytotechnology (or had your training)?
_____ Yes, same laboratory
_____ Yes, same city but not same laboratory
_____ Yes, same state but not same city
_____ No, out of the state where training obtained

6. Consultation
a. To what extent is the laboratory director available for cytologic consultation?
_____ In the laboratory at all times
_____ Often (in the laboratory at least once a day)
_____ Available when needed but not in the laboratory ever day
_____ Available by telephone or mail only
_____ Not always available when needed
_____ Never
_____ Other (Please specify) _____

b. To what extent is your immediate supervisor (chief cytotechnologist or the like) available for consultation?
_____ In the laboratory at all times
_____ Often (In the laboratory at least once a day)
_____ Available when needed but not in the laboratory every day
_____ Available by telephone or mail only
_____ Not always available when needed
_____ Never
_____ Other (Please specify) _____

c. How often do you consult your immediate supervisor?
_____ Daily
_____ Weekly
_____ Monthly
_____ Seldom
_____ Never
_____ Other (Please specify) _____

7. Do you make decisions about the selection of equipment, reagents, etc, that are purchased for your laboratory?
On all items
_____ Yes, help others
_____ Yes, have complete responsibility
_____ No, do not have this responsibility

On some items
_____ Yes, help others
_____ Yes, have complete responsibility
_____ No, do not have this responsibility

8. Have your duties and responsibilities for your job been clearly defined for you by your immediate supervisor?
_____ Yes _____ No

9. Do you think that you have the responsibility to use independent judgment in the performance of your duties?

_____ Yes _____ No

10. Do you freely discuss problems about specimen quality or confer about patients' clinical history with physicians or others requesting work in your laboratory?

_____ Yes _____ No

11. Does a physician review all of the slides you have screened?

_____ Yes _____ No

If "No", which of the following does he (she) review? (Use more than one choice if appropriate.)

_____ Positive slides
_____ Inconclusive slides (doubtful or suspicious)
_____ Sample of negative slides
_____ Other (Please specify) _____________________
_____ None

12. Does your department staff have the opportunity to review together the cases and/or slides that have been screened previously as a part of the daily work load?

_____ Yes
    _____ Daily
    _____ Weekly
    _____ Bi-monthly
    _____ Monthly
    _____ Other (Please specify) _____________________

_____ No, the department staff does not have slide review sessions.

If "Yes", who participates in these sessions?

_____ Entire staff including all pathologists and cytotechnologists
_____ Laboratory director, only, with chief and staff cytotechnologists
_____ Chief and cytotechnologists only
_____ Pathologists and/or other physicians only
_____ Other (Please specify) _____________________

13. What information sources do you use to correlate clinical and cytologic diagnoses (whenever this correlation is necessary)?

_____ Surgery schedule
_____ Medical records
_____ Surgical report from pathology department
_____ Autopsy report from pathology department
_____ Other (Please specify) _____________________
_____ None

14. Does a pathologist or another physician on your staff instruct clinicians in proper methods of specimen procurement to assure proper sampling and cell distribution on the slide?

_____ Yes
_____ No, but other staff members do
_____ No, this is never done
_____ Other (Please specify) _____________________

Instructions for questions 15, 16, and 17

There are three columns to the right of each set of responses for these statements. The first column (left to right) is for indicating your experience* as a student in the AMA accredited school of cytotechnology. If you completed your clinical study (training) in a laboratory outside of a school of cytotechnology, please use the second column to indicate your experience there. The third column is for indicating your experience on your present job. If you did your clinical study (training) in a laboratory that was not and A.M.A. accredited school of cytotechnology, please use the columns under "Student" to indicate what you learned in that laboratory as a student.

Please indicate your replies by placing a check mark in the appropriate columns below.

| | Student | | Present |
|---|---|---|---|
| | School of C.T. | Other Lab. | Job |
| 15. Identification and verification of specimens. | | | |
| a. Record the appearance of all specimens on their request/report forms immediately after they are received in the laboratory. | | | |
| Yes | ____ | ____ | ____ |
| No, only non-genital specimens | ____ | ____ | ____ |
| No, none | ____ | ____ | ____ |
| No, someone else in the laboratory does this | ____ | ____ | ____ |
| Other (Please specify) ________________ | ____ | ____ | ____ |
| b. Use serial accession numbers for verification of patients and case numbers. | | | |
| Yes | ____ | ____ | ____ |
| No | ____ | ____ | ____ |
| No, someone else in the laboratory does this | ____ | ____ | ____ |
| Other (Please specify) ________________ | ____ | ____ | ____ |
| c. Record the case number on equipment used in processing a non-genital case to avoid confusion of specimens. | | | |
| Yes | ____ | ____ | ____ |
| No | ____ | ____ | ____ |
| No, someone else in the laboratory does this | ____ | ____ | ____ |
| d. Check, routinely, the patients' names and/or accession numbers on the micro slides with those on the request/report forms before processing the slides. | | | |
| Yes | ____ | ____ | ____ |
| No | ____ | ____ | ____ |
| No, someone else in the laboratory does this | ____ | ____ | ____ |
| e. Routinely record the number of slides and filtration units made from a specimen or case at the beginning of processing. | | | |
| Yes | ____ | ____ | ____ |
| No | ____ | ____ | ____ |
| No, someone else in the laboratory does this | ____ | ____ | ____ |
| Use this record to verify the number of slides per case. | | | |
| Yes | ____ | ____ | ____ |
| No | ____ | ____ | ____ |
| No, someone else in the laboratory does this | ____ | ____ | ____ |

---

* Experience (student and job) is defined as performing the listed function more than once.

| | Student | | Present |
|---|---|---|---|
| | School of C.T. | Other Lab. | Job |
| 16. Staining specimens | | | |
| a. Regularly check shelf life of reagents and discard those that have expired. | | | |
| Yes | ____ | ____ | ____ |
| No | ____ | ____ | ____ |
| No, someone else in the laboratory does this | ____ | ____ | ____ |
| b. Make stains and reagents used in the laboratory. | | | |
| Yes | ____ | ____ | ____ |
| No, purchase some and make some | ____ | ____ | ____ |
| No, purchase all from supply company | ____ | ____ | ____ |
| No, centrally prepared in institution | ____ | ____ | ____ |
| No, someone else in the laboratory does this | ____ | ____ | ____ |
| No, other (Please specify) ________________ | ____ | ____ | ____ |
| c. Regularly examine slides for quality of staining such as definition of intra-nuclear structure, intensity of nuclear stain, etc. | | | |
| Yes,each staining batch (slides) | ____ | ____ | ____ |
| Yes, daily | ____ | ____ | ____ |
| Yes, weekly | ____ | ____ | ____ |
| Yes, change of staining solution (batch of stain) | ____ | ____ | ____ |
| Yes, other (Please specify) ________________ | ____ | ____ | ____ |
| No, someone else in the laboratory does this | ____ | ____ | ____ |
| No, it is never done | ____ | ____ | ____ |
| No, other (Please specify) ________________ | ____ | ____ | ____ |
| d. Filter stains prior to using them. | | | |
| Yes, each time slides are stained | ____ | ____ | ____ |
| Yes, several times a day | ____ | ____ | ____ |
| Yes, once a day | ____ | ____ | ____ |
| Yes, once a week | ____ | ____ | ____ |
| Yes, other (Please specify) ________________ | ____ | ____ | ____ |
| No, someone else in laboratory does this | ____ | ____ | ____ |
| No, it is never done | ____ | ____ | ____ |
| e. Filter alcohols for staining procedure prior to using them. | | | |
| Yes, each time slides are stained | ____ | ____ | ____ |
| Yes, several times a day | ____ | ____ | ____ |
| Yes, once a day | ____ | ____ | ____ |
| Yes, once a week | ____ | ____ | ____ |
| Yes, other (Please specify) ________________ | ____ | ____ | ____ |
| No, someone else in laboratory does this | ____ | ____ | ____ |
| No, it is never done | ____ | ____ | ____ |
| f. Frequency of changing stains in staining dishes | | | |
| Daily | ____ | ____ | ____ |
| Weekly | ____ | ____ | ____ |
| Monthly | ____ | ____ | ____ |
| Other (Please specify) ____________________ | ____ | ____ | ____ |
| No, someone else in the laboratory does this | ____ | ____ | ____ |

| | Student | | Present |
|---|---|---|---|
| | School of C.T. | Other Lab. | Job |
| 16. g. Frequency of changing alcohol solutions used in staining. | | | |
| Daily | ___ | ___ | ___ |
| Weekly | ___ | ___ | ___ |
| Monthly | ___ | ___ | ___ |
| Other (Please specify) ____________________ | ___ | ___ | ___ |
| No, someone else in the laboratory does this | ___ | ___ | ___ |
| h. Separate staining of body cavity fluids (hypercellular specimens) to prevent cell and debris contamination. | | | |
| Yes | ___ | ___ | ___ |
| No | ___ | ___ | ___ |
| No, someone else in the laboratory does this | ___ | ___ | ___ |
| 17. Indicate those of the following procedures you learned and performed as a student and those you are doing on your present job. | | | |
| a. Obtaining specimens | | | |
| Female genital | | | |
| Vaginal aspiration | ___ | ___ | ___ |
| Vaginal irrigation | ___ | ___ | ___ |
| Pipette | ___ | ___ | ___ |
| Cotton swab | ___ | ___ | ___ |
| Cervical spatula | ___ | ___ | ___ |
| Other (Please specify) ______________ | ___ | ___ | ___ |
| Non-genital | | | |
| Gastric washes | ___ | ___ | ___ |
| Oral | ___ | ___ | ___ |
| Aerosol-induced respiratory specimens | ___ | ___ | ___ |
| b. Special cyto-preparatory techniques | | | |
| Centrifuging | ___ | ___ | ___ |
| Cell filtration (e.g., Gelman, Millipore, Nucleopore, etc.) | ___ | ___ | ___ |
| Irrigation | ___ | ___ | ___ |
| c. Staining | | | |
| Papanicolaou (or modification) | ___ | ___ | ___ |
| Hormonal (e.g., Shorr, cresyl-echt-violet) | ___ | ___ | ___ |
| Cytogenetic (e.g., Fuelgen, Guard, etc.) | ___ | ___ | ___ |
| d. Microscopic cytomorphology | | | |
| Female Genital | | | |
| Cervical spatula | ___ | ___ | ___ |
| Vaginal | ___ | ___ | ___ |
| Endocervical | ___ | ___ | ___ |
| Endometrial | ___ | ___ | ___ |
| Irrigation | ___ | ___ | ___ |
| Respiratory | | | |
| Sputum | ___ | ___ | ___ |
| Bronchial washings | ___ | ___ | ___ |
| Gastrointestinal tract | | | |
| Esophageal | ___ | ___ | ___ |
| Gastric | ___ | ___ | ___ |
| Colon | ___ | ___ | ___ |

| | Student | | Present |
|---|---|---|---|
| | School of C.T. | Other Lab. | Job |
| 17. d. Microscopic cytomorphology (continued) | | | |
| Serous fluids | | | |
| Pleural | _____ | _____ | _____ |
| Ascitic | _____ | _____ | _____ |
| Pericardial | _____ | _____ | _____ |
| Urine | _____ | _____ | _____ |
| Breast | _____ | _____ | _____ |
| Oral | _____ | _____ | _____ |
| e. Other microscopic evaluation | | | |
| Hormonal | _____ | _____ | _____ |
| Radiation or chemotherapy | _____ | _____ | _____ |
| Viral | _____ | _____ | _____ |
| Cytogenetics | _____ | _____ | _____ |
| Electron microscopy or other special microscopic techniques (Please specify) _____ | _____ | _____ | _____ |
| Acridine Orange fluorescence technique | _____ | _____ | _____ |

18. How many lectures did you have during the 12 months of clinical study? (Give numbers in spaces provided)

| | | | | |
|---|---|---|---|---|
| Basic Science | _____ | lectures per week for | _____ | weeks. |
| Cytology | _____ | lectures per week for | _____ | weeks. |
| Cytopreparatory techniques | _____ | lectures per week for | _____ | weeks. |

19. How many quizzes and/or examinations did you have during the 12 months of clinical study?

_____ Approximately one a day
_____ Approximately one a week
_____ Approximately one a month
_____ Less than one a month
_____ Other (Please specify) _____

20. Approximately how many hours per day did you devote to screening slides

a. during the first 6 months of your clinical study (training)

_____ 1 hour per day
_____ 2 hours per day
_____ 3 hours per day
_____ 4 hours per day
_____ 5 hours per day
_____ 6 hours per day
_____ 7 hours per day
_____ 8 hours per day

b. during the second 6 months of your clinical study (training)

_____ 1 hour per day
_____ 2 hours per day
_____ 3 hours per day
_____ 4 hours per day
_____ 5 hours per day
_____ 6 hours per day
_____ 7 hours per day
_____ 8 hours per day

21. Do you think that your education has prepared you to perform the duties assigned to you in your work?

_____ Yes _____ No

If "No", what additional education do you need?

_____

_____

22. What kind of continuing education have you had since you completed your cytotechnology program?

a. Academic credit for

| | | |
|---|---|---|
| ____ Bachelor's degree | ____ Completed | ____ Not completed |
| ____ Master's degree | ____ Completed | ____ Not completed |
| ____ Doctorate | ____ Completed | ____ Not completed |

b. Non-credit earning

____ Workshops by A.S.C.P. Commission on Continuing Education
____ Workshops by American Society of Cytology
____ Regional workshops or seminars pertaining to cytology (e.g., Johns Hopkins, University of Kentucky, etc.)
____ Other (Please specify) ____________________

c. Organizational meetings

____ American Society of Clinical Pathologists
____ American Society of Cytology
____ American Society of Medical Technologists
____ Other (Please specify) ____________________

____________________

23. We would like to contact the person who is directly responsible for supervising your work (your immediate supervisor) to obtain information about conditions of work in your laboratory. We will appreciate your giving us permission to contact him (her).

Name: ____________________

Address: ____________________
(Street)
____________________
(City) (State) (Zip Code)

Thank you for your assistance.

Note: This questionnaire contains an error in question 5.e. in the listing of non-supervisory positions. Those for the supervisory level were inadvertently repeated for the non-supervisory level. The cytotechnologists replying apparently detected this as an error and responded in a manner which enabled sufficient definition of non-supervisory positions.

July 1967

NATIONAL COUNCIL ON
**Medical Technology Education**
**1025 E. H. Crump Boulevard, Memphis, Tenn. 38104**
***area 901*** ***phone 526-6581***

***research associate:*** RUTH I. HEINEMANN, MT (ASCP) ***education associate:*** ARCH LUGENBEEL
***council members:*** REX D. COUCH, M.D., CHAIRMAN; NELLIE MAY BERING, MT (ASCP); JOSEPH A. CUNNINGHAM, M.D.; MARY FRANCES JAMES, MT (ASCP), TYRA T. HUTCHENS, M.D.; AND ROBERT W. COON, M.D., EX OFFICIO

In October 1964, the National Council on Medical Technology Education was established by the National Committee for Careers in Medical Technology through funds provided by the Cancer Control Program of the U.S. Public Health Service. General Information about the Council is enclosed. You will note that the American Society of Medical Technologists and the American Society of Clinical Pathologists have demonstrated interest in the Council's study of various aspects of medical technology education.

One of the purposes of our project is to study how education relates to the work done by medical laboratory personnel. In order to uncover the pertinent relationships between education and work for cytotechnologists we have prepared questions for which we need the answers. We selected for our study group the people who took the ASCP Registry examination in cytotechnology in 1965. You are one of the people in this group. The enclosed questionnaire is designed to obtain information about you and your work. Most questions can be answered easily by checking an appropriate reply. Please complete and return it in the enclosed self-addressed envelope as soon as possible. Your replies will be kept in confidence.

The establishment of the N.C.M.T.E. provides an opportunity to clarify issues in the development of education programs for medical laboratory personnel. By completing and returning the questionnaire promptly, you will contribute to the efforts of the Council in the furtherance of our education programs.

Thank you for your interest in participating in this study.

Sincerely,

(Miss) Ruth I. Heinemann, M.T.(ASCP)
Research Associate

RIH/nr

NATIONAL COUNCIL ON
**Medical Technology Education**
1025 E. H. Crump Boulevard, Memphis, Tenn. 38104
*area 901* *phone 526-6581*

*research associate:* RUTH I. HEINEMANN, MT (ASCP) *education associate:* ARCH LUGENBEEL

*council members:* REX D. COUCH, M.D., CHAIRMAN; NELLIE MAY BERING, MT (ASCP); JOSEPH A. CUNNINGHAM, M.D.; MARY FRANCES JAMES, MT (ASCP), TYRA T. HUTCHENS, M.D.; AND ROBERT W. COON, M.D., EX OFFICIO

Several weeks ago you should have received a letter and form from the office of the National Council on Medical Technology Education asking you to participate in the Cytotechnologist Study. You are one of 358 people selected for this study. To date we have received replies from 152 people. If possible, we would like to hear from everyone to know whether or not each is employed and, if so, to have the replies to the items in the form.

Since we have not heard from you, this is to remind you to return the form with an appropriate reply. If, for some reason, you have not received the letter and form, please let us know immediately so that we may send them to you.

We will appreciate hearing from you within the next two weeks.

Sincerely,

(Miss) Ruth I. Heinemann,M.T.(ASCP)
Research Associate

RIH/nr

3

# APPENDIX D

## Questionnaire to Laboratory Supervisors, Job Performance Evaluation Form, and Introductory Letters

NATIONAL COUNCIL ON MEDICAL TECHNOLOGY EDUCATION
1025 E. H. Crump Boulevard
Memphis, Tennessee 38104

## CYTOTECHNOLOGIST STUDY

### Supervisor's Form A

On the attached sheets there are eight major items to be considered in evaluating personnel. The first five are categories of performance. Under each there are statements describing personnel activities and attitudes to be considered by supervisors in determining level of job performance. Please read each statement carefully and rank the cytotechnologist under consideration according to the following scale:

1 = Excellent performance
2 = Good performance
3 = Average performance
4 = Less than average performance
5 = Unsatisfactory performance
6 = Does not apply

Write the appropriate number in the space provided ("Rating") at the left of each statement. There is a possibility that a few statements may not be applicable to your laboratory situation. If a statement does not apply to your situation, you may rank it as "6".

Items 6, 7, and 8 are self-explanatory.

Since this is a study, this form is not designed for general use as an evaluation tool. It should not be used as such until its worth has been demonstrated.

Thank you for your assistance.

NATIONAL COUNCIL ON MEDICAL TECHNOLOGY EDUCATION
1025 E. H. Crump Boulevard
Memphis, Tennessee 38104

## CYTOTECHNOLOGIST STUDY

### Supervisor's Form A

Supervisor of Cytotechnologist #_________ Supervisor # _________

Rating

1. Skills

______ a. Consistently uses good technique in the preparation and staining of cytologic specimens.
______ b. Accurately records and reports the gross appearance of non-genital specimens.
______ c. Takes all necessary precautions to keep cytopreparatory equipment and work areas clean.
______ d. Understands basic principles of the Papanicolaou staining procedure and can prepare solutions as required.
______ e. Keeps lens and mechanism of microscope clean and instrument covered when not in use.
______ f. Understands practical aspects of microscopic technique and can apply this knowledge to obtain optimum illumination.
______ g. Maintains good posture at the microscope.
______ h. Has good manual dexterity demonstrated in handling specimens, equipment, and the microscope (in routine screening).
______ i. Uses marking apparatus skillfully. (That is, markings are neat and of consistent size, etc.)
______ j. Uses discrimination in selection of cells or fields to be marked.
______ k. Understands significance of background patterns and non-epithelial findings (blood elements, viral inclusions, organisms, etc.) in the total interpretation of the specimen.
______ l. Recognizes degree of atypia and its relationship to severity of lesion.
______ m. Understands physiology of menstruation and utilizes this knowledge in making reliable hormonal evaluations.
______ n. Can logically relate cytomorphologic findings to patient history or provisional clinical diagnosis.
______ o. Organizes work efficiently so that necessary quantity of work is completed with desirable quality of performance.

2. Dependability

______ a. Arrives at laboratory on time and begins work promptly. (Note: Consider not only arrival but also return from lunch and coffee breaks.)
______ b. Volunteers a reasonable number of times for changes in schedule or extra duty as required by circumstances. (That is, shares this proportionately with other members of the staff.)
______ c. Amount of sick leave taken has been minimal and/or justified.
______ d. Requests for annual leave (vacation) have been reasonable (within established policy) and considerate of the total staff.
______ e. Special requests of unplanned short absences have been minimal or non-existent. (Doctor's, dentist's or other special appointments.)
______ f. Gives notice of absence sufficiently in advance so that laboratory work schedule can be satisfactorily adjusted.
______ g. Remains on duty until all work assigned to him (her) is completed.
______ h. Does not habitually ask others to complete or assist with completion of work assignments.
______ i. Will accept duties and instructions given by supervisor and will complete them without further reminder. (That is, requires a minimum amount of supervision.)
______ j. Consults supervisor about unusual problems and/or situations (technical and/or administrative) when necessary.
______ k. Plans work to meet all ordinary and most unusual situations.

**Rating** **3. Reliability**

______ a. Follows technical procedures as outlined in the laboratory using instructions as guides.
______ b. Abides by established personnel and other administrative policies.
______ c. Demonstrates use of good judgment by obtaining and analyzing facts and applying them to situations to reach logical decisions in technical and non-technical situations.
______ d. Possesses both the deep sense of responsibility and the conscientiousness that are necessary in making decisions that involve the well-being of a patient.
______ e. Voluntarily reviews cytology slides for which the diagnosis has not been confirmed by subsequent pathology report.
______ f. When necessary, determines the source of technical problems by checking reagents and introducing variations of procedure ("trouble shooting").
______ g. Regularly records essential facts about specimens (physical appearance, general condition, unusual aspects, etc.) on report form immediately upon their receipt in the laboratory.
______ h. Numbers all cases and specimens immediately upon their receipt in the laboratory (serial accession).
______ i. Legibly labels all equipment and slides used in processing a case.
______ j. Routinely checks the patients' names and accession numbers on micro slides before and during preparation, staining, screening, and reporting.
______ k. Regularly examines stained material for quality of staining such as definition of intra-nuclear structure, intensity of nuclear stain, etc.
______ l. Takes appropriate precautions to maintain high quality of staining solutions (such as regularly filtering and changing stain, alcohol solutions and water).

**4. Initiative**

______ a. Looks for things to do and does them without being asked. (This includes technical work and duties necessary to maintain a clean, orderly work area, etc.).
______ b. Voluntarily assists co-workers with work.
______ c. Voluntarily does and reports additional laboratory work to prove or enhance findings when circumstances warrant. (Such as special processing, staining, etc.).
______ d. Readily undertakes any procedure requested in his area of responsibility with little or no instruction from supervisor.
______ e. Reads publications pertaining to work. (Evident by conversation about publications and/or interest in introducing newly reported methods, hints for improving techniques, etc.).
______ f. Readily supports and puts into practice changes made in procedures (technical and/or administrative) in the interest of accuracy, precision, efficiency, etc.
______ g. Shows desire to continue education by attending local, regional and/or national educational meetings within the past 18 months.
______ h. Attends educational programs offered within the institution as work schedule and opportunity allow. (Such as in-service training sessions; Pathology Conference; Medical, Surgical and Grand Rounds; guest lecturers; etc.).
______ i. Reports, formally or informally, on attendance at educational meetings for the benefit of other members of the staff.
______ j. Constructively suggests modifications of administrative policies if occasion arises.
______ k. Willingly accepts responsibility to participate in teaching students. (If there is a teaching program.)
______ l. Attends department slide review or other conferences regularly.
______ m. Readily learns to use new equipment.
______ n. Readily accepts and puts into practice changes in technical procedures that are recommended by supervisor.
______ o. Participates in trying and proving new methods and procedures.
______ p. Regularly and critically reviews the results of his own work to avoid reporting errors.

Rating 5. Personal Relations

| | |
|---|---|
| ______ | a. Well liked by co-workers. |
| ______ | b. Respected by co-workers for good use of professional ability and judgment, exemplary personal conduct, etc. |
| ______ | c. Readily accepts instruction and constructive criticism from supervisors. |
| ______ | d. Shows interest in and respect for laboratory assistants and readily helps them with technical problems. |
| ______ | e. Personal appearance is exemplary: clean uniform and shoes, personally neat, etc. |
| ______ | f. Has disposition (temperament) suited to the repetitive, sedentary nature of most of the work in cytotechnology. |

6. Would you promote this person to a higher position if you had the opportunity?

______ Yes ______ No

If your answer is "No", does this mean that you think this person is displaying his maximum capability and has reached his maximum work potential?

______ Yes ______ No

If your answer is still "No", what are your reasons for not wanting to promote this person?

7. If there are other factors you consider in your evaluation of personnel, please list them below and comment.

8. Work Load
   a. What was the total number of cases studies in your laboratory in 1966?
      1) Female genital ______________________
      2) Non-genital ______________________
   b. What was the total number of slides studied in your laboratory in 1966?
      1) Female genital ______________________
      2) Non-genital ______________________

July 1967

NATIONAL COUNCIL ON MEDICAL TECHNOLOGY EDUCATION
1025 E. H. Crump Boulevard
Memphis, Tennessee 38104

## CYTOTECHNOLOGIST STUDY

### Supervisor's Form B

Supervisor of Cytotechnologist #____________ Supervisor #____________

Please select or give the replies best describing you and your position.

1. Name: ________________________________________________
(Last) (First) (Middle)

2. Certification Number:
C.T.(ASCP) ____________
M.T.(ASCP) ____________
H.T.(ASCP) ____________
Other: (Please specify type and number) ____________
None: ____________

3. Age: ____________

4. Total length of your experience in cytotechnology (cytology):
_____ 6 months or less
_____ 7 through 12 months
_____ 13 through 18 months
_____ 19 through 24 months
_____ 25 through 30 months
_____ 31 through 36 months
_____ 37 through 42 months
_____ 43 through 48 months
_____ 49 months or more
Please specify number _____

a. Number of positions you have had prior to your present position
_____ None
_____ One
_____ Two
_____ Three
_____ Four
_____ Five
_____ Six
_____ Seven
_____ More than seven
_____ Please specify number

b. Type of positions you have had prior to your present position.
_____ Non-supervisory ("Staff") (Other than research)
_____ Supervisory (Other than research)
_____ Sole Cytotechnologist (Other than research)
_____ Research: Non-supervisory ("Staff")
_____ Research: Supervisory
_____ Research: Sole Cytotechnologist

5. Present place of employment:
Name of Institution: ________________________________________

Address: ________________________________________
(Street)
________________________________________
(City) (State) (Zip Code)

6. Title of your present position: ________________________________________

If supervisor of a laboratory department (section), please specify the department:

________________________________________

7. Number of years in present position
_____ 6 months
_____ 7 through 12 months
_____ 13 through 18 months
_____ 19 through 24 months
_____ 25 through 30 months
_____ 31 through 36 months
_____ 37 through 42 months
_____ 43 through 48 months
_____ 49 months or more
Please specify number __________

8. Number of people you supervise in your laboratory:
Technical: C.T.(ASCP) _____
M.T.(ASCP) _____
H.T.(ASCP) _____
C.L.A.(ASCP) _____
Other technologists: _____
Other laboratory assistants: _____
Other technical (Please specify) ______________________________________________

______________________________________________

Clerical: __________

Maintenance: __________

9. Education
a. How many years did you attend college (university)?
_____ None
_____ Less than 1 year
_____ 1 year
_____ 2 years
_____ 3 years
_____ 4 years
_____ 5 years
_____ 6 years
_____ More than 6 years

b. In what major field did you study and what degree did you receive?
_____ No degree but took courses in (major field) ______________________________

_____ Bachelor's degree in ______________________________________________

_____ Master's degree in ______________________________________________

_____ Doctorate in ______________________________________________

_____ Other (Please specify) ______________________________________________

c. Have you had formal education and/or training in cytotechnology and/or cytology?
_____ Yes: AMA accredited school of cytotechnology
_____ Yes: Pathology Residency
_____ No

d. How long did you attend an AMA accredited school of cytotechnology?
_____ Did not attend
_____ 6 months
_____ 12 months
_____ Other (Please specify) ______________________________________________

9. Education (continued)
   e. What continuing education programs have you attended in the past 18 months?
      1) Academic credit for
         _____ Bachelor's degree: Completed_____ Not completed_____
         _____ Master's degree: Completed_____ Not completed_____
         _____ Doctorate: Completed_____ Not completed_____

      2) Non-credit earning:
         _____ ASCP Commission on Continuing Education Workshops, Tutorials, etc.
         _____ Workshops of American Society of Cytology
         _____ Regional workshops or seminars pertaining to cytology (e.g., Johns Hopkins, University of Kentucky, etc.)
         _____ Other (Please specify) ____________________

      3) Organizational meetings (convention, etc.)
         _____ American Society of Clinical Pathologists
         _____ American Society of Cytology
         _____ American Society of Medical Technologists
         _____ College of American Pathologists
         _____ Other (Please specify) ____________________

      4) Other types of continuing education not mentioned above:
         (Please specify)
         ____________________
         ____________________

10. To what professional organizations do you belong?
    _____ American Association for the Advancement of Science
    _____ American Association of Bioanalysts
    _____ American Association of Clinical Chemists
    _____ American Society of Clinical Pathology
    _____ American Society of Cytology
    _____ American Society of Medical Technologists
    _____ American Society of Microbiologists
    _____ College of American Pathologists
    _____ Other: (Please specify) ____________________
    ____________________

11. Of the following scientific journals and periodicals which have you read in the past 6 months? If there are others not listed, please specify them under "Other" if you read them regularly.
    _____ American Journal of Clinical Pathology
    _____ American Journal of Obstetrics and Gynecology
    _____ The American Journal of Pathology
    _____ Acta Cytologica
    _____ CA
    _____ Cancer
    _____ Cancer Research
    _____ Laboratory Investigation
    _____ Stain Technology
    _____ Yearbook of (Cancer, Internal Medicine, Obstetrics and Gynecology, Pathology, Clinical Pathology)
    _____ Other: ____________________
    ____________________

12. How many textbooks related to your work have you used frequently in the past 6 months?

_____ None
_____ 1 textbook
_____ 2 textbooks
_____ 3 textbooks
_____ 4 textbooks
_____ 5 textbooks
_____ 6 textbooks
_____ 7 textbooks
_____ More than 7 textbooks:
Please specify number _______

Thank you for your assistance

July 1967

NATIONAL COUNCIL ON

**Medical Technology Education**

**1025 E. H. Crump Boulevard, Memphis, Tenn. 38104**
***area 901*** ***phone 526-6581***

***research associate:*** RUTH I. HEINEMANN, MT (ASCP) ***education associate:*** ARCH LUGENBEEL

***council members:*** REX D. COUCH, M.D., CHAIRMAN; NELLIE MAY BERING, MT (ASCP); JOSEPH A. CUNNINGHAM, M.D.; MARY FRANCES JAMES, MT (ASCP); TYRA T. HUTCHENS, M.D.; AND ROBERT W. COON, M.D., EX OFFICIO

In October 1964, the National Council on Medical Technology Education was established by the National Committee for Careers in Medical Technology through funds provided by the Cancer Control Program of the U.S. Public Health Service. General information about the Council is enclosed. You will note that the Council has been studying various aspects of medical technology education.

The first phase of study is devoted to determining whether or not there is a relationship between an individual's education and his job performance. We selected the people who took the 1965 ASCP certification examination for cytotechnologists for our study in this specialty. To each person selected, we have sent a questionnaire seeking information about his place of employment and the kind of work he is doing. Each is asked to give permission to obtain information from his supervisor. To each supervisor named, we are sending a request for information about the person selected.

gave your name as her immediate supervisor. We will appreciate your giving your time to complete the enclosed forms from your experience as her supervisor. Your replies will be kept in confidence.

The establishment of the National Council on Medical Technology Education provides an opportunity to clarify issues in the development of education programs for medical laboratory personnel. By completing and returning the questionnaire promptly, you will contribute to the efforts of the Council in the furtherance of our education programs.

Thank you for your interest in participating in this study.

Sincerely,

(Miss) Ruth I. Heinemann, M.T.(ASCP)
Research Associate

RIH/nr

N A T I O N A L   C O U N C I L   O N
**Medical Technology Education**
**1025 E. H. Crump Boulevard, Memphis, Tenn. 38104**
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***research associate:*** RUTH I. HEINEMANN, MT (ASCP) ***education associate:*** ARCH LUGENBEEL
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A few weeks ago you should have received a letter and forms from the office of the National Council on Medical Technology Education asking you to assist in a study.

Your name was given as supervisor of one of the 358 people from the group taking the 1965 Registry examination for cytotechnologists which has been selected for the study. To date we have received replies from 237 of these examinees and sent forms to their supervisors where indicated. The information from the supervisors is necessary in order that we can complete the study.

Since we have not heard from you, this is to remind you to return the forms with appropriate replies. If, for some reason, you have not received the letter and forms, please let us know immediately so that we may send them to you.

We will appreciate hearing from you within the next two weeks.

Sincerely,

(Miss) Ruth I. Heinemann, M.T.(ASCP)
Research Associate

RIH/nr

## APPENDIX E

# Essentials for Acceptable Schools of Cytotechnology
# Requirements for Certification in Exfoliative Cytology

# Essentials of an Acceptable School of Cytotechnology

## Revised to December 1, 1962

*Prepared by the Council on Medical Education and Hospitals of the American Medical Association with the cooperation of the American Society of Clinical Pathologists, and presented to the House of Delegates of the American Medical Association for approval.*

Two organizations are primarily concerned with the training of cytotechnologists: the Council on Medical Education and Hospitals of the American Medical Association, and the American Society of Clinical Pathologists through its Committee on Cytotechnology and Board of Schools of Medical Technology. The Board of Schools is primarily concerned with the evaluation and survey of schools of cytotechnology, acting in an advisory capacity to the Council. It also assists the Council in the maintenance of high standards of education and in the development of new schools of cytotechnology. The Board of Registry of Medical Technologists investigates and certifies the competency of the cytotechnologists who are graduates of approved schools.

The cooperating groups have established the following standards for this type of training for the information of schools, physicians, hospitals, prospective students, and others, and for the protection of the public.

Cytotechnologists are being trained in these schools to work under the direction of qualified physicians and not as independent practitioners.

### I. Administration

**1.** Acceptable schools for training in exfoliative cytology may be conducted by approved medical schools, hospitals, or other acceptable laboratories suitably organized in accordance with present educational standards.

**2.** All training of cytotechnologists shall be under competent medical supervision.

**3.** The resources for continued operation of a school should be insured through regular budgets, gifts, or endowments, but not entirely through students' fees. Such a training school for exfoliative cytology should not be operated for profit, and students should not be exploited for service. Schools should adhere to proper and suitable ethical and educational standards recognized by the Board of Schools of Medical Technology, the American Society of Clinical Pathologists, and the American Medical Association.

### II. Faculty and Personnel

**4.** The director must be a pathologist certified by the American Board of Pathology or be eligible for certification by this Board and recognized as having special interest and competence in cytology with special training and experience in exfoliative cytology. The director should be actively engaged in cytology. The director, or an associate with equivalent acceptable qualifications, shall be in attendance for sufficient period throughout the training course to take an active part in and properly supervise the laboratory work and teaching.

**5.** The teaching staff should include qualified instructors adequate for both group and individual instruction. It should include at least one instructor, in addition to the director, who is a registered cytotechnologist or eligible for registration, and who is actively engaged in cytology.

**6.** Enrollment in a school should not exceed 2 students to each member of the teaching staff.

**7.** A minimum of 2 students is recommended for enrollment in each class.

### III. Organization

**8.** Adequate space, light, and modern equipment should be provided within the department for the teaching of cytotechnology. A library containing texts and up-to-date reference material pertaining to cytology and cytotechnology should be maintained, or be readily accessible to the institution.

**9.** Approved schools for training in exfoliative cytology should be associated with an acceptable institution which:

*a.* Maintains a current cytology test volume of at least 5,000 specimens per year to furnish adequate material for training and test screening experience for students. The distribution of specimen material should preferably include an adequate quantity of at least 3 of the following: female genital tract, respiratory system, gastrointestinal system, and effusions. The availability of supplementary and essential teaching material for adequate cytology study sets may be considered in lieu of the specified diagnostic service volume for the diversification of type and source of cytologic material. The quality of the material available for teaching is more important than the actual volume.

*b.* Maintains an adequate system of filing, recording, and indexing of results in the associated laboratory for proper cytologic correlation and evaluation. There should be close liaison with clinical services or physicians supplying cytologic material.

### IV. Prerequisites for Admission

**10.** The applicant must complete 2 years (60 semester hours or 90 quarter hours) of work in an accredited college or university before being accepted by an approved school of cytotechnology. This preparatory work must include a minimum of 12 semester hours or 18 quarter hours of biology (which may include courses in general biology, bacteriology, parasitology, physiology, anatomy, histology, embryology, and zoology). It is strongly recommended that the balance of the required total of 60 semester hours include courses in English, chemistry, general mathematics, and physics.

The holder of a registered medical technologist certificate (ASCP) will also be eligible for admission.

### V. Curriculum

**11.** Length of course:

*a.* A minimum of 6 calendar months shall be provided in the training course, of which not less than 4 shall be consecutive.

*b.* A second 6 months of work experience acceptable to the director of the student's training program shall be completed before the student can be declared eligible by the director for examination by the Registry of Medical Technologists. This second 6 months of experience need not necessarily be in an approved school of cytotechnology, but certification and approval of this second phase of the training program must be made to the Registry by the director of the student's program.

**12.** A detailed curriculum should be provided, a copy of which is to be submitted with the application for approval. The curriculum should include the historical background of cytology, the application of cytology in clinical medicine, and the use and limitations of cytology in screening and diagnosis of both malignant and benign diseases. Lectures and demonstrations in anatomy, histology, embryology, cytochemistry, cytophysiology, endocrine alterations or abnormalities, and inflammatory diseases should be presented. The preparation of materials for examination, record keeping, indexing, and methods of correlating cytology with the pathological diagnoses should be taught.

**13.** Regular textbook assignments, lectures, and demonstrations should be planned. Assigned time for practice in the screening of specimens should be part of the planned curriculum and testing procedure. A complete record of practical and written examinations should be maintained and continually evaluated. Although emphasis should rightfully be placed on cytology of the female genital tract, instruction in the cytology of the gastrointestinal tract, urinary tract, body cavities, lung, and other organs should be given appropriate attention.

### VI. Ethics

**14.** Excessive student fees and commercial advertising should be considered unethical. Schools conducted primarily for the purpose of substituting students for paid technologists will not be considered for approval.

### VII. Health

**15.** Applicants for admission to an approved school shall be required to submit evidence of good health and successful vaccinations, and a report of a medical examination should be a part of the student's records. This examination shall include a roentgen examination of the chest. Provisions should be made for medical care and reasonable hospitalization.

### VIII. Admission to the Approved List

**16.** Application for approval of a school for the training of cytotechnologists should be made to the Council on Medical Education and Hospitals of the American Medical Association, 535 N. Dearborn, Chicago 10. Forms will be supplied for this purpose on request and should be completed by the director of the school requesting this approval. Inquiries regarding the registration of qualified cytotechnologists should be addressed to the Board of Registry of Medical Technologists, Post Office Box 44, Muncie, Ind.

**17.** Approval may be withdrawn whenever in the opinion of the Council a school does not maintain an educational program at least in accordance with the above minimum standards. Whenever a training program has not been in operation for a period of 2 consecutive years, approval may also be withdrawn.

**18.** Approved schools should notify the Council on Medical Education and Hospitals of the American Medical Association whenever a change occurs in the directorship of a school.

# Essentials of an Acceptable School of Cytotechnology

## December 1, 1967

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Two organizations are primarily concerned with the training of cytotechnologists: the Council on Medical Education of the American Medical Association, and the American Society of Clinical Pathologists through its Committee on Cytotechnology and Board of Schools of Medical Technology. The Board of Schools is primarily concerned with the evaluation and survey of schools of cytotechnology, acting in an advisory capacity to the Council. It also assists the Council in the maintenance of high standards of education and in the development of new schools of cytotechnology. The Board of Registry of Medical Technologists investigates and certifies the competency of the cytotechnologists who are graduates of approved schools.

The cooperating groups have established the following standards for this type of training for the information of schools, physicians, hospitals, prospective students, and others, and for the protection of the public.

Cytotechnologists are being trained in these schools to work under the direction of qualified physicians and not as independent practitioners.

### I. ADMINISTRATION

1. Acceptable schools for training in exfoliative cytology may be conducted by approved medical schools, hospitals, or other acceptable laboratories suitably organized in accordance with present educational standards.

2. All training of cytotechnologists shall be under competent medical supervision.

3. The resources for continued operation of a school should be insured through regular budgets, gifts, or endowments, but not entirely through students' fees. Such a training school for exfoliative cytology should not be operated for profit, and students should not be exploited for service. Schools should adhere to proper and suitable ethical and educational standards recognized by the Board of Schools of Medical Technology, the American Society of Clinical Pathologists, and the American Medical Association.

### II. FACULTY AND PERSONNEL

4. The director must be a pathologist certified by the American Board of Pathology or be eligible for certification by this Board and recognized as having special interest and competence in cytology with special training and experience in exfoliative cytology. The director should be actively engaged in cytology. The director, or an associate with equivalent acceptable qualifications, shall be in attendance for sufficient period throughout the training course to take an active part in and properly supervise the laboratory work and teaching.

5. The teaching staff should include qualified instructors adequate for both group and individual instruction. It should include at least one instructor, in addition to the director, who is a registered cytotechnologist or eligible for registration, and who is actively engaged in cytology.

6. Enrollment in a school should not exceed 2 students to each member of the teaching staff.

7. A minimum of 2 students is recommended for enrollment in each class.

### III. ORGANIZATION

8. Adequate space, light, and modern equipment should be provided within the department for the teaching of cytotechnology. A library containing texts and up-to-date reference material pertaining to cytology and cytotechnology should be maintained, or be readily accessible to the institution.

9. Approved schools for training in exfoliative cytology should be associated with an acceptable institution which:

a. Maintains a current cytology test volume of at least 5,000 specimens per year to furnish adequate material for training and test screening experience for students. The distribution of specimen material should preferably include an adequate quantity of at least 3 of the following: female genital tract, respiratory system, gastrointestinal system, and effusions. The availability of supplementary and essential teaching material for adequate cytology study sets may be considered in lieu of the specified diagnostic service volume for the diversification of type and source of cytologic material. The quality of the material available for teaching is more important than the actual volume.

b. Maintains an adequate system of filing, recording, and indexing of results in the associated laboratory for proper cytologic correlation and evaluation. There should be close liaison with clinical services or physicians supplying cytologic material.

## IV. PREREQUISITES FOR ADMISSION

10. The applicant must complete 2 years (60 semester hours, or 90 quarter hours) of work in an accredited college or university before being accepted by an approved school of cytotechnology. This preparatory work must include a minimum of 12 semester hours or 18 quarter hours of science. It is preferable that all 12 semester hours of science be in the biological sciences (which may include courses in general biology, bacteriology, parasitology, physiology, anatomy, histology, embryology, and zoology). However, 8 semester hours (12 quarter hours) of biology and 4 semester hours (6 quarter hours) of another science is acceptable.

The following are eligible for admission irrespective of the science credits possessed:

a. The holder of a registered medical technologist certificate (ASCP).

b. The holder of a baccalaureate degree from an accredited college or university.

## V. CURRICULUM

11. Length of course:
Training shall be for a minimum of one year (12 months). However, at the discretion of the school director, the second half of the year (6 months) may be taken in a laboratory selected by the director of the approved school. Only laboratories having adequate clinical material and at least one ASCP registered cytotechnologist may be selected for the last 6 months of training.

12. A detailed curriculum should be provided, a copy of which is to be submitted with the application for approval. The curriculum should include the historical background of cytology, the application of cytology in clinical medicine, the use and limitations of cytology in screening and diagnosis of both malignant and benign diseases. Lectures and demonstrations in anatomy, histology, embryology, cytochemistry, cytophysiology, endocrine alterations or abnormalities, and inflammatory diseases should be presented. The preparation of materials for examination, record keeping, indexing, and methods of correlating cytology with the pathological diagnoses should be taught.

13. Regular textbook assignments, lectures, and demonstrations should be planned. Assigned time for practice in the screening of specimens should be part of the planned curriculum and testing procedure. A complete record of practical and written examinations should be maintained and continually evaluated. Although emphasis should rightfully be placed on cytology of the female genital tract, instruction in the cytology of the gastrointestinal tract, urinary tract, body cavities, lung, and other organs should be given appropriate attention.

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## VII. HEALTH

15. Applicants for admission to an approved school shall be required to submit evidence of good health and successful vaccinations, and a report of a medical examination should be a part of the student's records. This examination shall include a roentgen examination of the chest. Provisions should be made for medical care and reasonable hospitalization.

## VIII. ADMISSION TO THE APPROVED LIST

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17. Approval may be withdrawn whenever in the opinion of the Council a school does not maintain an educational program at least in accordance with the above minimum standards. Whenever a training program has not been in operation for a period of 2 consecutive years, approval may also be withdrawn.

18. Approved schools should notify the Council on Medical Education of the American Medical Association whenever a change occurs in the directorship of a school.

# REQUIREMENTS FOR CERTIFICATION IN EXFOLIATIVE CYTOLOGY

The Registry of Medical Technologists of the American Society of Clinical Pathologists.
41st Ed. Page 10. December 1964.

"7. Certification in Exfoliative Cytology

High school graduates who completed (italicized) six months of training in Exfoliative Cytology previous to January 1, 1960, and whose technical qualifications can be verified by a pathologist or other physician recognized as a specialist in Cytology, may be considered eligible for the examination on subsequent completion of two years of full time experience in cytology.

Candidates with two years of college, 60 semester hours or 90 quarter hours, including 12 semester hours or 18 quarter hours of biology, may be considered if they have the training mentioned above, plus six months of full time experience in cytology.

Candidates whose training began on or after January 1, 1960, must have:

a. 2 years of college credits from a college or university approved by a recognized regional accrediting agency, 60 semester hours or 90 quarter hours, including 12 semester hours or 18 quarter hours of biology.
b. 6 months of training in a laboratory approved by the Council on Medical Education and Hospitals of the American Medical Association.
c. 6 months of full time experience in cytology in an acceptable laboratory.

Both a practical and a written examination will be given. Only those who pass the written examination will be eligible to take the practical examination. Candidates must pass both sections of the examination, and in case of failure must repeat both sections."

The Registry of Medical Technologists of The American Society of Clinical Pathologists.
46th Ed. Second Printing. Page 9. October 1967

"7. Certification in Exfoliative Cytology

High school graduates who completed (italicized) six months of training in Exfoliative Cytology previous to January 1, 1960, and whose technical qualifications can be verified by a pathologist or other physician recognized as a specialist in Cytology, may be considered eligible for the examination on subsequent completion of two years of full time experience in cytology.

Candidates with two years of college, 60 semester hours or 90 quarter hours, including 12 semester hours or 18 quarter hours of biology, may be considered if they have the training mentioned above, plus six months of full time experience in cytology.

MT(ASCP) registrants are eligible to enter Approved Schools of Cyto-technology.

Candidates whose training began on or after January 1, 1960, must have:

a. 2 years of college credits from a college or university approved by a recognized reional accrediting agency, 60 semester hours or 90 quarter hours, including 12 semester hours or 18 quarter hours of biology.

b. 6 months of training in a School of Cytotechnology approved by the Council on Medical Education of the American Medical Association.

c. 6 months of full-time experience in cytotechnology in a laboratory acceptable to the pathologist who directed the formal six months of training.

Both a practical and a written examination will be given. In case of failure candidates must repeat both sections."

# BIBLIOGRAPHY

1. Crowson, S.H.; Wideman, F.D.; Cunningham, J.A.: The Alabama Pilot Study. National Committee for Careers in Medical Technology. Washington, D.C. 1963.
Final report of a three-year project, 1959-1962, for the improvement of medical technology education sponsored by the National Committee for Careers in Medical Technology on a grant from the Cancer Control Program, Public Health Service, U.S. Department of Health, Education, and Welfare.

2. Davies, D.F.; Ed.: Clinical Cytology and the Pathologist. The American Cancer Society, Inc. New York, N.Y. Publ. 1962.
Papers and recommendations of the workshop on cytology sponsored by the College of American Pathologists and American Society of Clinical Pathologists, Inc. through support from the American Cancer Society and the Cancer Control Program, Division of Chronic Diseases, Public Health Service, U.S. Department of Health, Education, and Welfare.

3. Anderson, E.; Frost, J.K.: Final Report. National Committee for Careers in Medical Technology. Washington, D.C. 1963.
An informational presentation regarding educational aspects in approved schools of cytotechnology based on the Cytology Field Project sponsored by the National Committee for Careers in Medical Technology with the support of the Cancer Control Program, Public Health Service, U.S. Department of Health, Education, and Welfare.

4. Baird, E.E.; Christopherson, W.M.: Workshop on Cytology Training for the Cytotechnologists and Pathologists. Board of Schools of Medical Technology of the American Society of Clinical Pathologists. Galveston, Texas. 1965.
Report of a conference sponsored by a grant from the Cancer Control Program of the Bureau of State Services, Public Health Service, U.S. Department of Health, Education, and Welfare.

5. National Correlations in Medical Technology Education. National Council on Medical Technology Education of the National Committee for Careers in Medical Technology. Washington, D.C. 1967.
A report of a study of the relationships among the performance of medical technologists in their work, pre-clinical and clinical study and certification examination. Conducted between 1964 and 1967 through a grant from Cancer Control Program, Public Health Service, U.S. Department of Health, Education, and Welfare.

# NATIONAL COUNCIL ON MEDICAL TECHNOLOGY EDUCATION

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| Nellie May Bering, B.S.,M.T.(ASCP) | Training Coordinator<br>Schools of Medical Technology<br>Doctors Hospital and Sibley Memorial Hospital<br>Washington, D. C. |
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| Tyra T. Hutchens, M.D. | Professor and Chairman<br>Department of Clinical Pathology<br>University of Oregon Medical School<br>Portland, Oregon |
| Mary Frances James, M.S.,M.T(ASCP) | Associate Professor and Chairman<br>Department of Medical Technology<br>School of Allied Health Professions<br>University of Kentucky<br>Lexington, Kentucky |
| Robert W. Coon, M.D., ex officio<br>Project Director | Chairman<br>Department of Pathology<br>University of Vermont college of Medicine<br>Burlington, Vermont |

## Advisory Committee

The Advisory Committee is composed of one representative from each of the following organizations:

Board of Registry of Medical Technologists, American Society of Clinical Pathologists
Board of Schools of Medical Technology, American Society of Clinical Pathologists
Board of Certified Laboratory Assistants, American Society of Clinical Pathologists
Education Committee, American Society of Medical Technologists
Board of Trustees, ASMT Education & Research Fund, Inc.

## Staff

| | |
|---|---|
| Ruth I. Heinemann, B.S.,M.T.(ASCP) | Research Associate<br>National Council on Medical Technology Education<br>Memphis, Tennessee |
| Archie G. Lugenbeel, M.Ed. | Education Associate<br>National Council on Medical Technology Education<br>Washington, D. C. |
| Barbara Pryor | Administrative Assistant<br>National Council on Medical Technology Education<br>Washington, D. C. |

## Consultants

| | |
|---|---|
| Arline Howdon, B.A.,C.T.(ASCP) | Chief Cytotechnologist<br>Johns Hopkins Hospital<br>Baltimore, Maryland |
| Irma Rube, M.S.,C.T.(ASCP) | Assistant Professor<br>Department of Pathology<br>University of Tennessee Medical Center<br>Memphis, Tennessee |